PATENT ABSTRACTS OF JAPAN

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(71)Applicant : NIPPON HOSO KYOKAI <NHK>
SHOWA DENKO KK

(72)Inventor : TOKITO SHIZUO
SUZUKI MICHINORI
TANAKA ISAO
INOUE YOJI
SHIRANE HIROO
TAKEUCHI MASATAKA
ITO NAOKO

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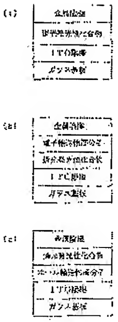
(54) ORGANIC LIGHT EMITTING DEVICE AND DISPLAY UNIT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an organic light emitting device using an organic polymeric phosphorescent compound which is stable and emits extremely highly efficient phosphorescence, and a display unit using the organic light emitting device.
SOLUTION: This organic light emitting device contains a plurality of organic polymeric layers sandwiched by an anode and a cathode, in which at least one layer of the organic polymeric layer includes a neutral organic polymeric phosphorescent compound emitting phosphorescence and the phosphorescent compound includes a phosphorescent unit being a repeat unit for emitting phosphorescence and a carrier transporting unit being a repeat unit for transporting a carrier. This display unit has a display screen in which each pixel of the display screen is made of the organic light emitting device and each pixel has a plurality of transistors.



CLAIMS

[Claim(s)]
[Claim 1]
In an organic light emitting element containing 1 or two or more organic polymer layers which were inserted into the anode and the negative pole,
At least one layer of said organic polymer layer contains a phosphorescence luminescence compound of a neutral organic high polymer which emits light in phosphorescence,
This phosphorescence luminescence compound includes a carrier transport nature unit which is a repeating unit which conveys a phosphorescence luminescence unit and a career which emit light in phosphorescence, and which are repeating units.
An organic light emitting element characterized by things.
[Claim 2]
Repetition number [of said phosphorescence luminescence unit] m, and repetition number n of said carrier transport nature unit,
$m<n$
The organic light emitting element according to claim 1 filling ******.
[Claim 3]
Repetition number [of said phosphorescence luminescence unit] m, and repetition number n of said carrier transport nature unit,
$0.0001<=m/(m+n) <=0.2$
The organic light emitting element according to claim 2 filling ******.
[Claim 4]
The organic light emitting element according to any one of claims 1 to 3 being meltable to an organic solvent or water in said phosphorescence luminescence compound.
[Claim 5]
The organic light emitting element according to any one of claims 1 to 4, wherein degrees of polymerization of said phosphorescence luminescence compound are 5 thru/or 5000.
[Claim 6]
The organic light emitting element according to any one of claims 1 to 5, wherein a phosphorescence luminescence part of said phosphorescence luminescence unit and/or a carrier transport nature part of said carrier transport nature unit constitute a side chain of said organic high polymer.
[Claim 7]
The organic light emitting element according to any one of claims 1 to 5, wherein a phosphorescence luminescence part of said phosphorescence luminescence unit and/or a carrier transport nature part of said carrier transport nature unit constitute a main chain of said organic high polymer.
[Claim 8]
The organic light emitting element according to any one of claims 1 to 7, wherein a carrier transport nature part of said carrier transport nature unit is a hole transportability part.
[Claim 9]
The organic light emitting element according to any one of claims 1 to 7, wherein a carrier

transport nature part of said carrier transport nature unit is an electron-transport-property part.

[Claim 10]
The organic light emitting element according to any one of claims 1 to 7, wherein a carrier transport nature part of said carrier transport nature unit consists of a hole transportability part and an electron-transport-property part.
[Claim 11]
The organic light emitting element according to any one of claims 1 to 10, wherein a phosphorescence luminescence part of said phosphorescence luminescence unit is monad or a bivalence group of a complex of a transition metal or a rare earth metal.
[Claim 12]
Monad of a complex of said transition metal or a rare earth metal is combined as a side chain of said organic high polymer via a spacer part to a main chain of said organic high polymer,
The organic light emitting element according to claim 11, wherein this spacer part contains an inorganic group with 1 thru/or 10 hetero atom which do not have an organic group or a carbon atom of the carbon numbers 1 thru/or 30 which may have a hetero atom.
[Claim 13]
A carrier transport nature part of said carrier transport nature unit, Monad of carbazole, monad of tertiary amine, monad of an imidazole derivative, Monad of a triazole derivative, monad of an oxadiazole derivative, a bivalence group of a thiophene, The organic light emitting element according to any one of claims 1 to 12 containing a basis chosen from a group of a basis which consists of a bivalence group of benzene, a bivalence group of styrene, and a bivalence group of a fluorene, and a group of a basis which replaced this basis by a substituent at least one or more kinds.
[Claim 14]
The organic light emitting element according to any one of claims 1 to 13, wherein said phosphorescence luminescence compound has two or more kinds of phosphorescence luminescence units which emit light in two or more colors which are different in [which emits light in one predetermined color / one kind or mutual / predetermined].
[Claim 15]
The organic light emitting element according to claim 14, wherein said phosphorescence luminescence unit consists of two kinds of phosphorescence luminescence units which emit light in blue or green and yellow, or red and said phosphorescence luminescence compound emits light white as a whole.
[Claim 16]
The organic light emitting element according to claim 14, wherein said phosphorescence luminescence unit consists of three kinds of phosphorescence luminescence units which emit light in blue, green, and red and said phosphorescence luminescence compound emits light white as a whole.
[Claim 17]
The organic light emitting element according to any one of claims 1 to 16, wherein at least one layer of said organic polymer layer contains said two or more phosphorescence luminescence compounds which have 1 or two or more kinds of phosphorescence luminescence units which emit light in a mutually different color.
[Claim 18]
The organic light emitting element according to claim 17, wherein at least one layer of said organic polymer layer emits light white as a whole.
[Claim 19]
At least one layer of said organic polymer layer contains said phosphorescence luminescence compound which has a phosphorescence luminescence unit which emits light in said phosphorescence luminescence compound and yellow, or red which has a phosphorescence luminescence unit which emits light blue or green, And the organic light emitting element according to claim 17 emitting light white as a whole.
[Claim 20]

The organic light emitting element according to any one of claims 1 to 16, wherein at least one layer of said organic polymer layer contains a carrier transport nature compound further.
[Claim 21]
The organic light emitting element according to claim 20, wherein said carrier transport nature compound is a carrier transport nature high molecular compound.
[Claim 22]
The organic light emitting element according to claim 21, wherein said carrier transport nature high molecular compound is a hole transportability high molecular compound.
[Claim 23]
The organic light emitting element according to claim 21, wherein said carrier transport nature high molecular compound is an electron-transport-property high molecular compound.
[Claim 24]
The organic light emitting element according to claim 20, wherein said carrier transport nature compound is a carrier transport nature low molecular weight compound.
[Claim 25]
The organic light emitting element according to claim 24, wherein said carrier transport nature low molecular weight compound is a hole transportability low molecular weight compound.
[Claim 26]
The organic light emitting element according to claim 24, wherein said carrier transport nature low molecular weight compound is an electron-transport-property low molecular weight compound.
[Claim 27]
The organic light emitting element according to any one of claims 1 to 26 by which a light filter being included between transparent substrates in which said anode and said anode are provided.
[Claim 28]
The organic light emitting element according to any one of claims 1 to 27, wherein said anode is formed on a plastic plate.
[Claim 29]
The organic light emitting element according to any one of claims 1 to 28, wherein said organic polymer layer is formed of the ink jet method or print processes.
[Claim 30]
In a display which has a display screen,
Each pixel of this display screen consists of the organic light emitting element according to any one of claims 1 to 29,
A display, wherein this each pixel has two or more transistors.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
This invention relates to a phosphorescence luminescence compound, a phosphorescence luminescence constituent, an organic light emitting element, and a display.
[Background of the Invention]
[0002]
As lights, such as displays, such as a flat-panel display, and a back light, the organic light emitting element which carries out electroluminescence from the thin film which consists of organic compounds attracts attention as an element which can obtain high-intensity luminescence by the low voltage.
[0003]
As a thin film material in an organic light emitting element, research and development of large-area-izing using a luminescent organic high polymer meltable to an organic solvent or water have been actively done with the organic high polymer of a styrene system or a fluorene series. As a method of forming such an organic high polymer, wet process, such as a spin coat method, print processes, and the ink JIETO method, is used. Especially the ink jet method is expected as a realistic pixel forming method of the display screen of a full color display, and the small full color trial production panel is also already indicated.
[0004]
On the other hand, the organometallic complex of platinum or iridium which utilizes the phosphorescence of luminescence which research of efficient-izing is overly done actively and is luminescence from the triplet excitation state of an organic compound is reported by the low-molecular-weight-compound system formed with a vacuum deposition method. The external light quantity child efficiency of an organic light emitting element in which this phosphorescence luminescence compound was used endures 5% of the elements using the conventional firefly luminescence, 8% and a well head are acquired, and the super-well head of no less than 15% is also attained very much by these days with devising the composition of an element (for example, refer to nonpatent literature 1.).
[0005]
The report of research of the doped type organic high polymer light emitting device which distributed this low molecule phosphorescence compound to the organic high polymer also occurs, In the element which doped the iridium complex to poly (N-vinylcarbazole) (PVK), about 4% of value is obtained as external light quantity child efficiency, and the extensive improvement is accepted (for example, refer to nonpatent literature 2.). Electrochemical luminescence is reported by the organic high polymer containing a ruthenium complex (for example, refer to nonpatent literature 3.).
[0006]
However, still, the conventional organic high polymer light emitting device which meant realizing large area-ization by low cost is not enough in respect of luminous efficiency. Since this cause uses the fluorescence which is luminescence from the singlet excitation state of the conventional organic high polymer, it is because the wall of 5% of maximum exists as theoretical outward luminous efficiency. Although it has the big feature that an organic polymer layer can form the light emitting device of an organic high polymer with wet process from the solution of an organic solvent or water, the improvement of the further luminous efficiency has been a technical problem to future utilization.
[0007]
The low molecule currently distributed in the polymers of luminescence which serve as a host although efficient-ization is overly tried by making the light emitting device of an organic high

polymer distribute a low-molecular phosphorescence luminescence compound is not stable, and the long lasting display which can bear long term reliability cannot be realized.
[0008]
Therefore, in consideration of utilization of the future of an organic light emitting element, membranes can be formed with wet process from the solution of an organic solvent or water, and development of the luminescent material of the new organic high polymer which large area-ization can be realized by low cost by this, and can realize stable, i.e., are long lasting, and overly efficient luminescence is desired.
[Nonpatent literature 1] Appl.Phys.Lett.,77,904(2000)
[Nonpatent literature 2] Jpn.J.Appl.Phys,39,L828(2000)
[Nonpatent literature 3] J.Mater.Chem.,9,2103(1999)
[Description of the Invention]
[Problem(s) to be Solved by the Invention]
[0009]
This invention is made in view of the above-mentioned problem, and is a thing.
The purpose is to provide the phosphorescence luminescence compound and phosphorescence luminescence constituent of an organic high polymer which are used as a material of ** and emit light in stable and overly efficient phosphorescence.

[0010]
An object of this invention is to provide the organic light emitting element which used the phosphorescence luminescence compound and phosphorescence luminescence constituent of said organic high polymer, and the display using this organic light emitting element.
[Means for Solving the Problem]
[0011]
In an included organic light emitting element, the first mode of this invention 1 or two or more organic polymer layers which were inserted into the anode and the negative pole at least one layer of said organic polymer layer, This phosphorescence luminescence compound includes a carrier transport nature unit which is a repeating unit which conveys a phosphorescence luminescence unit and a career which emit light in phosphorescence, and which are repeating units including a phosphorescence luminescence compound of a neutral organic high polymer which emits light in phosphorescence.
It is an organic light emitting element characterized by things.
[0012]
In a display in which the second mode of this invention has a display screen, each pixel of this display screen consists of an organic light emitting element which is the first mode of this invention, and this each pixel is a display having two or more transistors.
[Effect of the Invention]
[0013]
According to this invention, it is used as a material of an organic light emitting element, and the phosphorescence luminescence compound of the organic high polymer which emits light in stable and overly efficient phosphorescence can be provided. This invention can provide the organic light emitting element which used the phosphorescence luminescence compound of said organic high polymer.
[Best Mode of Carrying Out the Invention]
[0014]
Next, an embodiment of the invention is described with a drawing.
[0015]
A 1st embodiment of this invention includes the phosphorescence luminescence unit which is a phosphorescence luminescence compound of the neutral organic high polymer which emits light in the phosphorescence used for an organic light emitting element, and is a repeating unit which emits light in phosphorescence, and the carrier transport nature unit which is repeating units which convey a career.

[0016]
The phosphorescence luminescence unit which is a phosphorescence luminescence compound of the neutral organic high polymer which emits light in the phosphorescence used for an organic light emitting element according to a 1st embodiment of this invention, and is a repeating unit which emits light in phosphorescence. Since the carrier transport nature unit which is a repeating unit which conveys a career is included, it is used as a material of an organic light emitting element, and the phosphorescence luminescence compound of the organic high polymer which emits light in stable and overly efficient phosphorescence can be provided.
[0017]
In the phosphorescence luminescence compound of a 1st embodiment of this invention, as for a 2nd embodiment of this invention, repetition number [of said phosphorescence luminescence unit] m and repetition number n of said carrier transport nature unit fill the relation of m<n.
[0018]
According to a 2nd embodiment of this invention, since repetition number [of said phosphorescence luminescence unit] m and repetition number n of said carrier transport nature unit fill the relation of m<n, they can raise the luminous efficiency of phosphorescence more.
[0019]
In the phosphorescence luminescence compound of a 2nd embodiment of this invention, as for a 3rd embodiment of this invention, repetition number [of said phosphorescence luminescence unit] m and repetition number n of said carrier transport nature unit fill the relation of 0.0001 <=m/(m+n) <=0.2.
[0020]
According to a 3rd embodiment of this invention, since repetition number [of said phosphorescence luminescence unit] m and repetition number n of said carrier transport nature unit fill the relation of 0.0001 <=m/(m+n) <=0.2, they can generate phosphorescence still more efficiently.
[0021]
A 4th embodiment of this invention is characterized by being meltable to an organic solvent or water in said phosphorescence luminescence compound in the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 3.
[0022]
Since it is meltable to an organic solvent or water in said phosphorescence luminescence compound according to a 4th embodiment of this invention, membrane formation by the wet process from a solution is attained.
[0023]
A 5th embodiment of this invention is characterized by the degrees of polymerization of said phosphorescence luminescence compound being 5 thru/or 5000 in the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 4.
[0024]
Since the degrees of polymerization of said phosphorescence luminescence compound are 5 thru/or 5000 according to a 5th embodiment of this invention, it is meltable to an organic solvent and a uniform and stable film can be formed.
[0025]
In the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 5, as for a 6th embodiment of this invention, the phosphorescence luminescence part of said phosphorescence luminescence unit and/or the carrier transport nature part of said carrier transport nature unit constitute the side chain of said phosphorescence luminescence compound.
[0026]
Since the phosphorescence luminescence part of said phosphorescence luminescence unit and/or the carrier transport nature part of said carrier transport nature unit constitute the side chain of said phosphorescence luminescence compound according to a 6th embodiment of this invention, Compounding is easy and it can be considered as the phosphorescence luminescence

compound which is easy to dissolve in an organic solvent.
[0027]
In the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 5, as for a 7th embodiment of this invention, the phosphorescence luminescence part of said phosphorescence luminescence unit and/or the carrier transport nature part of said carrier transport nature unit constitute the main chain of said phosphorescence luminescence compound.
[0028]
Since the phosphorescence luminescence part of said phosphorescence luminescence unit and/or the carrier transport nature part of said carrier transport nature unit constitute the main chain of said phosphorescence luminescence compound according to a 7th embodiment of this invention, movement of a complex portion is suppressed and a stable phosphorescence luminescence compound can be obtained also at an elevated temperature.
[0029]
An 8th embodiment of this invention is characterized by the carrier transport nature part of said carrier transport nature unit being a hole transportability part in the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 7.
[0030]
Since the carrier transport nature part of said carrier transport nature unit is a hole transportability part according to an 8th embodiment of this invention, career balance can obtain the phosphorescence luminescence compound whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence part and a hole transportability part.
[0031]
A 9th embodiment of this invention is characterized by the carrier transport nature part of said carrier transport nature unit being an electron-transport-property part in the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 7.
[0032]
Since the carrier transport nature part of said carrier transport nature unit is an electron-transport-property part according to a 9th embodiment of this invention, career balance can obtain the phosphorescence luminescence compound whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence part and an electron-transport-property part.
[0033]
In the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 7, as for a 10th embodiment of this invention, the carrier transport nature part of said carrier transport nature unit consists of a hole transportability part and an electron-transport-property part.
[0034]
Since the carrier transport nature part of said carrier transport nature unit consists of a hole transportability part and an electron-transport-property part in the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 7 according to a 10th embodiment of this invention, Without having all the functions of luminescence, hole transportability, and electron transport property, and blending other organic materials, it is thermally stable and long lasting.
[0035]
As for said phosphorescence luminescence unit, an 11th embodiment of this invention is characterized by a phosphorescence luminescence part being the monad or bivalence group of a complex of a transition metal or a rare earth metal in the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 10.
[0036]
Since the phosphorescence luminescence part of said phosphorescence luminescence unit is the monad or bivalence group of a complex of a transition metal or a rare earth metal according to an 11th embodiment of this invention, it can be considered as the phosphorescence

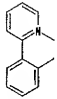
luminescence part where the luminous efficiency of phosphorescence is high.
[0037]
In the phosphorescence luminescence compound of an 11th embodiment of this invention, a 12th embodiment of this invention the monad of the complex of said transition metal or a rare earth metal, Joining together as a side chain via a spacer part to a main chain, this spacer part contains an inorganic group with 1 thru/or 10 hetero atom which do not have the organic group or carbon atom of the carbon numbers 1 thru/or 30 which may have a hetero atom.
[0038]
According to a 12th embodiment of this invention, the monad of the complex of said transition metal or a rare earth metal, Join together as a side chain via a spacer part to a main chain, and this spacer part, Since an inorganic group with 1 thru/or 10 hetero atom which do not have the organic group or carbon atom of the carbon numbers 1 thru/or 30 which may have a hetero atom is included, The flexibility of movement of a complex portion increases, the solubility to an organic solvent is improved, and stable and high luminous efficiency can be acquired because a uniform thin film is producible by the applying method.
[0039]
In the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 11 a 13th embodiment of this invention, The carrier transport nature part of said carrier transport nature unit The monad of carbazole, The monad of tertiary amine, monad of an imidazole derivative, monad of a triazole derivative, The basis chosen at least one or more kinds is included from the group of the basis which consists of the monad of an oxadiazole derivative, a bivalence group of styrene, and a bivalence group of a fluorene, and the group of a basis which replaced this basis by the substituent.
[0040]
According to a 13th embodiment of this invention, said carrier transport nature unit, A carrier transport nature part The monad of carbazole, the monad of tertiary amine, The monad of an imidazole derivative, the monad of a triazole derivative, the monad of an oxadiazole derivative, From the group of the basis which consists of a bivalence group of styrene, and a bivalence group of a fluorene, and the group of a basis which replaced this basis by the substituent, since the basis chosen at least one or more kinds is included, it can be considered as the carrier transport nature part where the performance which conveys a career is high.
[0041]
A 14th embodiment of this invention has two or more kinds of phosphorescence luminescence units which emit light in two or more colors which are different in [which emits light in one predetermined color / one kind or mutual / predetermined] in the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 13.
[0042]
Since it has two or more kinds of phosphorescence luminescence units which emit light in two or more colors which are different in [which emits light in one predetermined color / one kind or mutual / predetermined] according to a 14th embodiment of this invention, light can be emitted suitably for the monochromatic or multiple, arbitrarily selected color.
[0043]
In the phosphorescence luminescence compound of a 14th embodiment of this invention, said phosphorescence luminescence unit consists of two kinds which emit light in blue or green and yellow, or red, and a 15th embodiment of this invention emits light white as a whole.
[0044]
According to a 15th embodiment of this invention, since said phosphorescence luminescence unit consists of two kinds which emit light in blue or green and yellow, or red and emits light white as a whole, it can emit light suitably for a white color.
[0045]
In the phosphorescence luminescence compound of a 14th embodiment of this invention, said phosphorescence luminescence unit consists of three kinds of those which emits light in blue, green, and red, and a 16th embodiment of this invention emits light white as a whole.

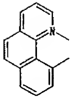
[0046]
According to a 16th embodiment of this invention, since said phosphorescence luminescence unit consists of three kinds which emit light in blue, green, and red and emits light white as a whole, it can emit light suitably for a white color.
[0047]
A 17th embodiment of this invention is a phosphorescence luminescence constituent containing the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 16.
[0048]
Since the phosphorescence luminescence compound of the embodiment of either the 1st of this invention thru/or 16 is included according to a 17th embodiment of this invention, a suitable phosphorescence luminescence constituent can be provided.
[0049]
An 18th embodiment of this invention is a phosphorescence luminescence compound of a 14th embodiment of this invention, and is a phosphorescence luminescence constituent which blends two or more 1 or things which it has two or more kinds for the phosphorescence luminescence unit which emits light in a mutually different color, and is characterized by things.
[0050]
According to an 18th embodiment of this invention, two or more 1 or things which it has two or more kinds are blended for the phosphorescence luminescence unit which emits light in a color which is a phosphorescence luminescence compound of a 14th embodiment of this invention, and is mutually different, and since, a suitable phosphorescence luminescence constituent can be provided.
[0051]
A 19th embodiment of this invention emits light white as a whole in the phosphorescence luminescence constituent of an 18th embodiment of this invention.
[0052]
Since light is emitted white as a whole according to a 19th embodiment of this invention, a suitable phosphorescence luminescence constituent can be provided.
[0053]
In the phosphorescence luminescence constituent of an 18th embodiment of this invention a 20th embodiment of this invention, The phosphorescence luminescence compound which has a phosphorescence luminescence unit which emits light in the phosphorescence luminescence compound and yellow, or red which has a phosphorescence luminescence unit which emits light blue or green is blended, and light is emitted white as a whole.
[0054]
According to a 20th embodiment of this invention, the phosphorescence luminescence compound which has a phosphorescence luminescence unit which emits light in the phosphorescence luminescence compound and yellow, or red which has a phosphorescence luminescence unit which emits light blue or green is blended, Since light is emitted white as a whole, a suitable phosphorescence luminescence constituent can be provided.
[0055]
It is a phosphorescence luminescence constituent which a 21st embodiment of this invention blends one of the phosphorescence luminescence compounds or phosphorescence luminescence constituents, and carrier transport nature high molecular compounds of an embodiment of the 1st of this invention thru/or 20, and is characterized by things.
[0056]
According to a 21st embodiment of this invention, a phosphorescence luminescence constituent blends one of the phosphorescence luminescence compounds or phosphorescence luminescence constituents, and carrier transport nature high molecular compounds of an embodiment of the 1st of this invention thru/or 20, and since, it is stable and long lasting. Career balance can provide the phosphorescence luminescence constituent whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence compound and a carrier

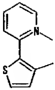
transport nature high molecular compound.
[0057]
A 22nd embodiment of this invention is characterized by said carrier transport nature high molecular compound being a hole transportability high molecular compound in the phosphorescence luminescence constituent of a 21st embodiment of this invention.
[0058]
Since said carrier transport nature high molecular compound is a hole transportability high molecular compound according to a 22nd embodiment of this invention, it is stable and long lasting. Career balance can provide the phosphorescence luminescence constituent whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence compound and a hole transportability high molecular compound.
[0059]
A 23rd embodiment of this invention is characterized by said carrier transport nature high molecular compound being an electron-transport-property high molecular compound in the phosphorescence luminescence constituent of a 21st embodiment of this invention.
[0060]
Since said carrier transport nature high molecular compound is an electron-transport-property high molecular compound according to a 23rd embodiment of this invention, it is stable and long lasting. Career balance can provide the phosphorescence luminescence constituent whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence compound and an electron-transport-property high molecular compound.
[0061]
It is a phosphorescence luminescence constituent which a 24th embodiment of this invention blends one of the phosphorescence luminescence compounds and carrier transport nature low molecular weight compounds of an embodiment of the 1st of this invention thru/or 20, and is characterized by things.
[0062]
According to a 24th embodiment of this invention, a phosphorescence luminescence constituent blends one of the phosphorescence luminescence compounds and carrier transport nature low molecular weight compounds of an embodiment of the 1st of this invention thru/or 20, and since, it is stable and long lasting. Career balance can provide the phosphorescence luminescence constituent whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence compound and a carrier transport nature low molecular weight compound.
[0063]
A 25th embodiment of this invention is characterized by said carrier transport nature low molecular weight compound being a hole transportability low molecular weight compound in the phosphorescence luminescence constituent of a 24th embodiment of this invention.
[0064]
Since said carrier transport nature low molecular weight compound is a hole transportability low molecular weight compound according to a 25th embodiment of this invention, it is stable and long lasting. Career balance can provide the phosphorescence luminescence constituent whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence compound and a hoe transportability low molecular weight compound.
[0065]
A 26th embodiment of this invention is characterized by said carrier transport nature low molecular weight compound being an electron-transport-property low molecular weight compound in the phosphorescence luminescence constituent of a 24th embodiment of this invention.
[0066]
Since said carrier transport nature low molecular weight compound is an electron-transport-property low molecular weight compound according to a 26th embodiment of this invention, it is stable and long lasting. Career balance can provide the phosphorescence luminescence

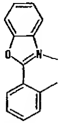
constituent whose luminous efficiency it is good and is high by changing the ratio of a phosphorescence luminescence compound and an electron-transport-property low molecular weight compound.
[0067]
In the organic light emitting element containing 1 or two or more organic polymer layers by which a 27th embodiment of this invention was inserted into the anode and the negative pole, at least one layer of said organic polymer layer contains one of the phosphorescence luminescence compounds or phosphorescence luminescence constituents of an embodiment of the 1st of this invention thru/or 26.
[0068]
According to a 27th embodiment of this invention, since one of the phosphorescence luminescence compounds or phosphorescence luminescence constituents of an embodiment of the 1st of this invention thru/or 26 are included, at least one layer of said organic polymer layer can provide the organic light emitting element which emits light in stable and overly efficient phosphorescence.
[0069]
In the organic light emitting element in which a 28th embodiment of this invention contains 1 or two or more organic polymer layers which were inserted into the anode and the negative pole, A light filter is allocated between the anode and the transparent substrate in which the anode is provided, and at least one layer of said organic polymer layer contains the phosphorescence luminescence constituent of the 19th of the phosphorescence luminescence compound of the 15th of this invention, or the embodiment of 16, or this invention, or the embodiment of 20.
[0070]
According to a 28th embodiment of this invention, it is allocated by the light filter between the anode and the transparent substrate in which the anode is provided, and at least one layer of said organic polymer layer, Since the phosphorescence luminescence constituent of the 19th of the phosphorescence luminescence compound of the 15th of this invention or the embodiment of 16 or this invention or the embodiment of 20 is included, the organic light emitting element which emits light in stable and overly efficient color light can be provided.
[0071]
As for a 29th embodiment of this invention, in the organic light emitting element of the 27th of this invention, or the embodiment of 28, said anode is formed on a plastic plate.
[0072]
Since said anode is formed on a plastic plate according to a 29th embodiment of this invention, a flexible organic light emitting element can be provided.
[0073]
As for a 30th embodiment of this invention, in the organic light emitting element of the embodiment of either the 27th of this invention thru/or 29, said organic polymer layer is formed of the ink jet method or print processes.
[0074]
According to a 30th embodiment of this invention, since said organic polymer layer is formed of the ink jet method or print processes, it can manufacture the organic polymer layer of a large area simple.
[0075]
In the display in which a 31st embodiment of this invention has a display screen, each pixel of said display screen consists of an organic light emitting element of the embodiment of either the 27th of this invention thru/or 30, and said each pixel drives a branch with the transistor beyond it.
[0076]
According to a 31st embodiment of this invention, each pixel of a display screen consists of an organic light emitting element of the embodiment of either the 27th of this invention thru/or 30, and since a branch has a transistor beyond it, said each pixel can provide the display of an active matrix system.

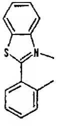
[0077]
Next, an embodiment of the invention is described with a drawing.
[0078]
This invention is an invention of the phosphorescence luminescence compound of the organic high polymer used as a material of an organic light emitting element, and includes the repeating unit (it is called a phosphorescence luminescence unit) which emits light in phosphorescence, and the repeating unit (it is called a carrier transport nature unit) which conveys careers, such as an electron and a hole. A phosphorescence luminescence unit and a carrier transport nature unit may be the random copolymers irregularly arranged in a polymers chain, and the phosphorescence luminescence compounds of the organic high polymer of this invention are nonionic, i.e., neutral, polymers. In the phosphorescence luminescence compound of this invention, the phosphorescence luminescence unit and the carrier transport unit have connected with the polymers chain, and since it is controlled, i.e., long lasting, and since condensation of a phosphorescence luminescence unit has not fluorescence but a phosphorescence luminescence unit, it can realize overly efficient luminescence.
[0079]
Typically, as shown in drawing 1, the structure of the phosphorescence luminescence compound of this invention, According to the kind of monomer which forms a phosphorescence luminescence unit and a carrier transport nature unit. (a) When both a phosphorescence luminescence part and a carrier transport nature part are in the main chain of polymers, (b) When a phosphorescence luminescence part is in the side chain of polymers and a carrier transport nature part is in the main chain of polymers, (c) A phosphorescence luminescence part is in the main chain of polymers, and a carrier transport nature part has four kinds of **, when it is in the side chain of polymers, and both (d) phosphorescence luminescence part and a carrier transport nature part are in the side chain of polymers. However, a phosphorescence luminescence part shows the portion which has a function which emits light in phosphorescence in a phosphorescence luminescence unit, and a carrier transport nature part expresses the portion which has the function to convey a career in a carrier transport nature unit.
[0080]
Here, it is desirable to have combined at least one side of a phosphorescence luminescence part and a carrier transport nature part with the main chain of the polymers of a phosphorescence luminescence compound as a side chain (drawing 1 (b) – (d)). In this case, it is easy to compound a phosphorescence luminescence compound, and it can be considered as the phosphorescence luminescence compound which is easy to dissolve in an organic solvent.
[0081]
As for a phosphorescence luminescence part, in order to consider it as the phosphorescence luminescence part where the luminous efficiency of phosphorescence is still higher, it is desirable that it is the monad or bivalence group of a complex of a transition metal or a rare earth metal.
[0082]
As the example of a phosphorescence luminescence part
[0083]
[Formula 1]

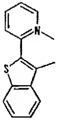

R-1

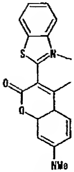

R-2

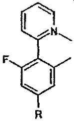

R-3

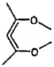

R-4


R-5


R-6


R-7


R-8


acac

There is the monad or bivalence group of the monad of a transition metal complex, a bivalence group, or a rare earth metal complex containing the ligand which is alike and is chosen from the shown group. The transition metal used for the above-mentioned transition metal complex contains from Hf of the third transition element series 72, i.e., an atomic number, to Hg of 80 from Y of the second transition element series 39, i.e., an atomic number, to Cd of 48 from the first transition element series of the periodic table, i.e., Sc of the atomic number 21, to Zn of 30. The rare earth metal used for the above-mentioned rare earth metal complex contains from the lanthanoid series sequence of the periodic table, i.e., La of the atomic number 57, to Lu of 71. A ligand may be a different ligand from the above-mentioned ligand.

[0084]

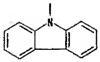
Examples of a carrier transport nature part where performance is high of conveying a career differ by a case where they are a case where phosphorescence luminescence compounds of an organic high polymer of this invention are hole transportability polymers, and electron-transport-property polymers.

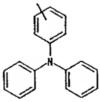
[0085]

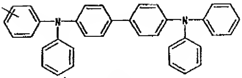
In the case of hole transportability polymers

[0086]

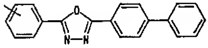
[Formula 2]

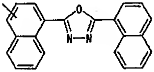

HT-1

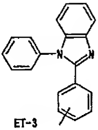

HT-2

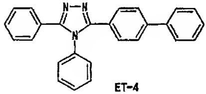

HT-3

It is alike, and monad, such as the carbazoles (HT-1) and the triphenylamines (HT-2) which are shown and which are tertiary amine, and those polymers (HT-3), is typical, and these monad may be replaced by the substituent.
[0087]
In the case of electron-transport-property polymers
[0088]
[Formula 3]

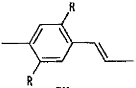

ET-1


ET-2

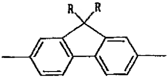

ET-3


ET-4

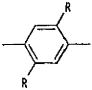
It is alike and the monad of the shown oxadiazole derivative (ET-1, 2), triazole derivative (ET-4), or imidazole derivative (ET-3) is mentioned. The aromatic ring of the monad of these derivatives may be replaced by the substituent. moreover
[0089]
[Formula 4]



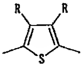
PV



FO

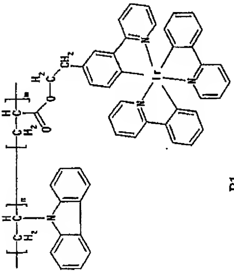


PP

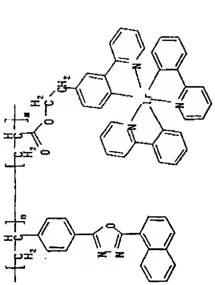


TF

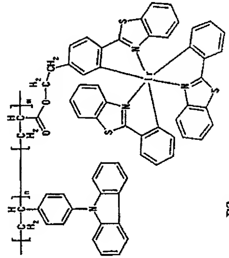
The bivalence group (TF) of a thiophene replaced by the substituent, the bivalence group (PP) of benzene and the bivalence group (PV) of styrene which form the polymers which are alike and have the transport capacity of a hole in fluorescence polymers as shown, and in which a main chain serves as a conjugated system, or the bivalence group (FO) of a fluorene may be used. The substituent R expresses an alkyl group or an alkoxy group here. In the phosphorescence luminescence compound of this invention, these bivalence groups are built into the main chain of polymers as a carrier transport nature part.
[0090]
As the example of copolymerization polymers including an above-mentioned repeating unit,
[0091]
[Formula 5]



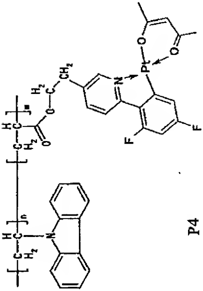
P1



P2



P3

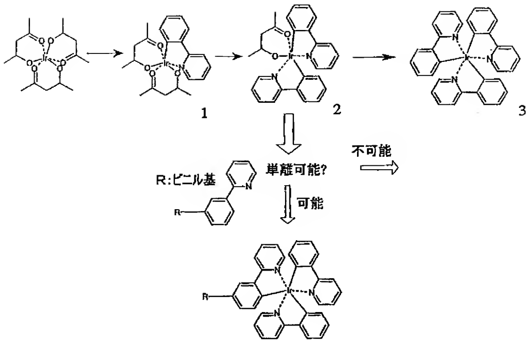


P4

It is alike and to the side chain of the vinyl structure which is a main chain as shown The monad of the iridium complex of a phosphorescence luminescence part, or a platinum complex, There are polymers (P2) which there are polymers (P1, P3, P4) which have the carbazole as a hole (career) transportability part or the monad of the derivative, and use the monad of an oxadiazole derivative for a side chain as an electronic (career) transportability part. These copolymerization polymers are compoundable by the radical copolymerization using a reactional initiator from a vinyl compound. The monomer which replaced one of the ligands of an iridium complex by the vinyl group

[0092]

[Formula 6]



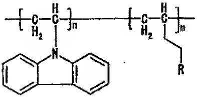
** -- the phenylpyridine replaced by the vinyl group is made to react in the middle of the ligand replacement reaction of an iridium complex like, and it generates and isolates.

[0093]

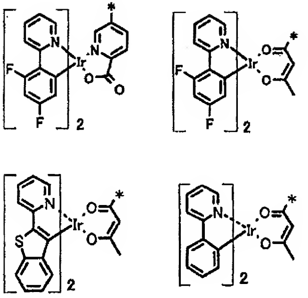
Further,

[0094]

[Formula 7]



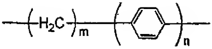
R=



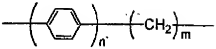
It is alike, and one of the ligands of an iridium complex as shown is an acetylacetone or picolinic acid, and there are also copolymerization polymers of the structure which the iridium complex combined with the main chain of polymers via this acetylacetone. Here, it is shown that * seal in a chemical formula is a portion (combination) linked to the substituent R shown in the chemical formula of polymers.
[0095]
Like the above-mentioned copolymerization polymers, when the transition metal complex portion or rare earth metal complex portions as a phosphorescence luminescence part, such as an iridium complex, join together as a side chain to the main chain of polymers, It is preferred to make a spacer part intervene between the monad of a transition metal complex or a rare earth metal complex and the main chain of polymers.
[0096]
A spacer part means a portion which combines between a multivalent atom which a replaceable atom in a high molecular compound which constitutes a main chain has combined, and multivalent atoms which a replaceable atom in a low molecular weight compound which becomes origin of a phosphorescence luminescence part has combined. As for such a spacer part, it is preferred that it is the structure containing an inorganic group with 1 thru/or 10 hetero atom which do not have an organic group or a carbon atom of the carbon numbers 1 thru/or 30 which may have a hetero atom.
[0097]
As a spacer part, it is an alkylene group of the carbon numbers 1 thru/or 20, for example,

[0098]
[Formula 8]

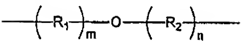
(S−1)



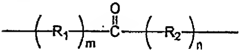
(S−2)



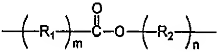
(S−3)



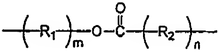
(S−4)



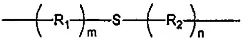
(S−5)



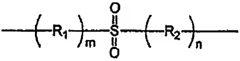
(S−6)



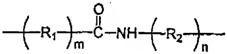
(S−7)



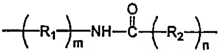
(S−8)



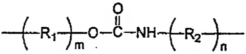
(S−9)



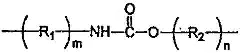
(S−10)



(S−11)

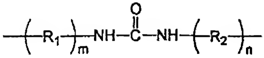


(S−12)

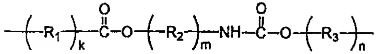


[0099]
[Formula 9]

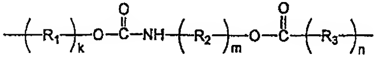
(S−13)



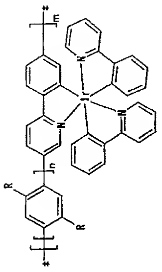
(S−14)

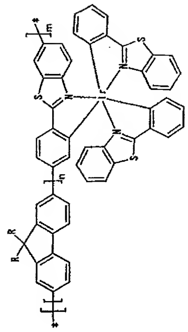


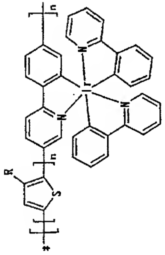
(S−15)

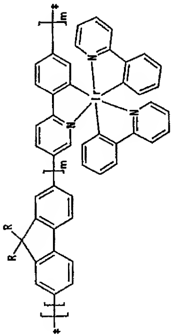


Although it can be alike and a connecting group as shown in (S−1) to (S−15) shown etc. can be mentioned, it is not limited to these.
[0100]
In (S−1) to (S−15), R_1, R_2, and R_3 show independently a phenylene group which is not replaced [a methylene group, substitution, or], respectively, and k, m, and n are 0, 1, or 2 independently, respectively.
[0101]
There are also copolymerization polymers of structure which included a phosphorescence luminescence part and a carrier transport nature part in a main chain instead of a side chain.
[0102]
[Formula 10]









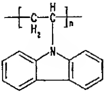
It is alike, and the thiophene, the benzene and the bivalence group of a fluorene which were replaced, and the bivalence group of an iridium complex polymerize, and the main chain is formed so that it may be shown.
[0103]

As mentioned above, although the copolymer with either a hole transportability part or the electron-transport-property parts, and a phosphorescence luminescence part was mentioned as an example of copolymerization polymers, the phosphorescence luminescence compound of this invention may be a copolymer of a hole transportability part, an electron-transport-property part, and a phosphorescence luminescence part. In this case, the hole transportability part, the electron-transport-property part, and the phosphorescence luminescence part may constitute the main chain of a copolymer independently, respectively, and may constitute the side chain.
[0104]
if a repetition number of m and a carrier transport nature unit is set to n for a repetition number of a phosphorescence luminescence unit, in order to raise luminous efficiency of phosphorescence in this invention, it is smaller than a repetition number of a carrier transport nature unit, a relation of m<n, i.e., a repetition number of a phosphorescence luminescence unit, -- it is desirable. However, both m and n are 1 or a natural number beyond it. Conversely, in m>=n, luminescence of phosphorescence will be controlled by concentration quenching. As for a rate of a repetition number of a phosphorescence luminescence unit, in order to realize overly efficient luminescence of phosphorescence, 0.2 or less are preferred among totals of a phosphorescence luminescence unit and a carrier transport nature unit. If a rate of a repetition number of a phosphorescence luminescence unit is too small, at least phosphorescence light-emitting part nature will decrease and luminous efficiency will fall. For this reason, there must not be too few rates of a repetition number of a phosphorescence luminescence unit, and it is desirable that it is 0.0001 or more. namely
0.0001<=m/(m+n) <=0.2
It comes out and a certain thing is desirable.
[0105]
A phosphorescence luminescence compound of this invention may have two or more kinds of phosphorescence luminescence units which emit light in two or more colors which may have one kind of phosphorescence luminescence unit which emits light in one color, and are mutually different.
[0106]
The phosphorescence luminescence compound of this invention can obtain the luminescent color which is not obtained with a phosphorescence luminescence compound which has only one kind of phosphorescence luminescence unit which emits light in one color by introducing two or more kinds of phosphorescence luminescence units which emit light in two or more mutually different colors.
[0107]
For example, a phosphorescence luminescence compound for white light is obtained by introducing into one compound three kinds of phosphorescence luminescence units which emit light in blue, green, and red, respectively by a suitable ratio. Here with a phosphorescence luminescence unit which emits light in blue, green, or red. When the luminescent color of photoluminescence will not show blue, green, or red, respectively when it uses independently, respectively and one phosphorescence luminescence compound is formed, or the further below-mentioned organic light emitting element is produced and is made to emit light, the luminescent color says what shows blue, green, or red, respectively.
[0108]
Blue of the luminescent color here says that whose peak wavelength in an emission spectrum is 400-490 nm. Similarly, green says that whose peak wavelength is 490-570 nm, and red says that whose peak wavelength is 570-700 nm.
[0109]
A phosphorescence luminescence compound for white light is obtained also by introducing into one compound two kinds of phosphorescence luminescence units which emit light in blue or green and yellow, or red, respectively by a suitable ratio.
[0110]
Blue or green of the luminescent color here says that whose peak wavelength in an emission

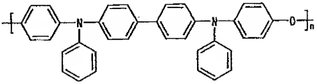
spectrum is 400-570 nm, and yellow or red says similarly that whose peak wavelength is 570-700 nm.
[0111]
Phosphorescence luminescence material for white light can be obtained also as a constituent which blended two or more phosphorescence luminescence compounds which have one or more kinds of phosphorescence luminescence units which show the luminescent color which is mutually different not only as above single phosphorescence luminescence compounds.
[0112]
For example, the 1st phosphorescence luminescence compound that has two kinds of phosphorescence luminescence units, a phosphorescence luminescence unit and a phosphorescence luminescence unit which emits light green, which emit light blue, A phosphorescence luminescence constituent which blended the 2nd phosphorescence luminescence compound that has one kind of phosphorescence luminescence unit which emits light in red, A phosphorescence luminescence constituent which blended three phosphorescence luminescence compounds which have at a time one kind of phosphorescence luminescence unit which emits light in blue, green, and red, respectively, Although a phosphorescence luminescence constituent etc. which blended two phosphorescence luminescence compounds which have at a time one kind of phosphorescence luminescence unit which emits light in blue and orange, respectively can be mentioned, it is not limited to these at all.
[0113]
As for a phosphorescence luminescence compound of an organic high polymer of this invention, it is desirable that membranes can be formed with wet process. In wet process, since a phosphorescence luminescence compound is used as a solution, a meltable thing is required for an organic solvent or water. In order to make especially a phosphorescence luminescence compound meltable to an organic solvent, it is desirable to use a metal complex replaced by a phosphorescence luminescence part with comparatively long chains, such as an alkyl group or an alkoxy group.
[0114]
As for a phosphorescence luminescence compound of an organic high polymer of this invention, it is preferred that degrees of polymerization are 5 thru/or 5000. If a degree of polymerization is smaller than five, formation of a uniform film will become difficult and being easy of membranous stability will become that crystallization takes place bad. An organic high polymer with a larger degree of polymerization than 5000 is difficult to generate, and becomes difficult to melt into an organic solvent. Therefore, a uniform and stable film can be formed by setting a degree of polymerization to 5 thru/or 5000.
[0115]
Below, an organic light emitting element of this invention is explained.
[0116]
A phosphorescence luminescence compound of an organic high polymer of this invention explained above can be used for an organic light emitting element of this invention as a luminescent material.
[0117]
In order to improve further the carrier transport nature of a phosphorescence luminescence compound of this invention, a constituent which blended a phosphorescence luminescence compound and a carrier transport nature compound of this invention can be used for an organic light emitting element of this invention as a luminescent material.
[0118]
That is, when a phosphorescence luminescence compound of this invention is hole transportability, an electron-transport-property compound can be mixed, and when a phosphorescence luminescence compound of this invention is electron transport property, a hole transportability compound can be mixed. At this time, an electron-transport-property compound and a hole transportability compound may be low molecular weight compounds, respectively, and may be a high molecular compound.

[0119]
As a low-molecular hole transportability compound blended with a phosphorescence luminescence compound of this invention, they are TPD (N,N'-diphenyl-N,N'-(3-methylphenyl)-1,1'-biphenyl 4,4'-diamine) and alpha-NPD (4,4'-screw). [N-(1-naphthyl)-N-phenylamino] Triphenylamine derivatives, such as biphenyl and m-MTDATA (4,4',4''-tris(3-methylphenyl phenylamino) triphenylamine), Although known hole carrying materials including carbazole derivatives, such as CBP (4,4'-N-N'-dicarbazole biphenyl), can be used, it is not limited to these.

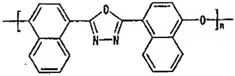
[0120]
As a hole transportability compound of polymers blended with a phosphorescence luminescence compound of this invention, Although a high molecular compound etc. of a polyvinyl carbazole and a thing which introduced and polymers-ized a polymerization nature functional group to a low molecular weight compound of a triphenylamine system, for example, a triphenylamine skeleton currently indicated by JP,8-157575,A, can be used, it is not limited to these.
[0121]
On the other hand as a low-molecular electron-transport-property compound blended with a phosphorescence luminescence compound of this invention, Although quinolinol derivative metal complexes, such as Alq_3 (trisaluminum quinolinol), an oxadiazole derivative, a triazole derivative, an imidazole derivative, a triazine derivative, etc. can be used, it is not limited to these.
[0122]
Although what introduced and polymers-ized a polymerization nature functional group to the above-mentioned low-molecular electron-transport-property compound, for example, poly PBD etc. which are indicated by JP,10-1665,A, can be used as an electron-transport-property compound of polymers blended with a phosphorescence luminescence compound of this invention, It is not limited to these.
[0123]
A high molecular compound which does not participate in a luminescent characteristic can be mixed, it can be considered as a constituent, and this can also be used for a phosphorescence luminescence compound or a phosphorescence luminescence constituent of this invention as a luminescent material in order to improve further the physical properties etc. of a film produced by forming membranes. For example, in order to give pliability to a film, PMMA (polymethylmethacrylate) is mixable, but it is not limited to this.
[0124]
an organic light emitting element, wherein it boils this invention further at least and it contains a phosphorescence luminescence compound of an above-mentioned organic high polymer again is provided. Since a phosphorescence luminescence unit and a carrier transport unit of a phosphorescence luminescence compound have connected an organic light emitting element of this invention with a polymers chain, Since condensation of a phosphorescence luminescence unit of a phosphorescence luminescence compound by a continuation drive and overheating of an organic light emitting element is controlled, and a stable display can be provided and it has not fluorescence but a phosphorescence luminescence unit, overly efficient luminescence is realizable.
[0125]
An organic light emitting element using a phosphorescence luminescence compound of this invention functions also by 1 lamination which sandwiched a phosphorescence luminescence compound of this invention by the anode and the negative pole of a couple, as shown in drawing 2 (a), but. In order to raise luminous efficiency of phosphorescence, laminated constitution with an electron transport layer using electron-transport-property polymers like drawing 2 (b) or laminated constitution with a hole transporting bed using hole transportability polymers like drawing 2 (c) is desirable. As these career (electron, hole) transportability polymers
[0126]
[Formula 11]



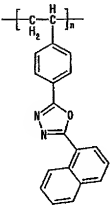
HTP1



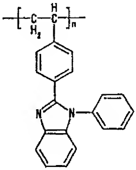
HTP2



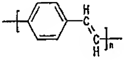
ETP1



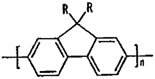
ETP2



ETP3



CP1



CP2

** -- polymers, poly para-phenylene vinylene (CP1), a poly dialkyl fluorene (CP2), etc. containing the basis of tertiary amine [like] and its derivative (HTP1, 2), an oxadiazole derivative (ETP1, 2), and an imidazole derivative (ETP3) are mentioned.

[0127]

In a light emitting device which has the laminated constitution of drawing 2 (b), an organic light emitting element using polymers ETP2 which contains a basis of an oxadiazole derivative as

electron-transport-property polymers explains luminescent mechanism briefly, using said polymers of P1 as a phosphorescence luminescence compound. An electron poured in from metal cathode is conveyed through an electron transport layer, it is poured in in a layer of the phosphorescence luminescence compound P1, and, on the other hand, a hole poured in from the ITO anode conducts a repeating unit containing a carbazole ring of the phosphorescence luminescence compound P1. when a poured-in electron recombines with a hole on a carbazole ring, an excitation state of a repeating unit of a carbazole ring generates -- the next -- repeating unit HEENERUKI movement of an iridium complex -- it carries out. As a result, an excitation triplet state is formed in a repeating unit of an iridium complex, and luminescence of phosphorescence is observed by energy relaxation. However, a poured-in hole and a mechanism in which electronic recombination happens on a repeating unit of an iridium complex are also considered.

[0128]

Generally, the anode is formed on a glass substrate which is a transparent substrate, and a luminescence permeable material is used for it. ITO (tin-oxide indium), indium oxide, tin oxide, or an indium oxide zinc oxide alloy is preferred. A thin film of metal, such as gold, platinum, silver, and magnesium, may be used. It is usable also in poly aniline, a polythiophene, polypyrrole, and a conductive polymer that consists of those derivatives.

[0129]

It is preferred from a viewpoint of electron injection efficiency to use alkaline-earth metals, such as alkaline metals, such as Li with a low work function and K, Mg, Ca, for the negative pole. It is also desirable to use stable aluminum etc. chemically as compared with these metal. In order to reconcile electron injection efficiency and chemical stability, it may be made a layer containing two or more sorts of materials. Those materials are indicated to JP,2-15595,A, JP,5-121172,A, etc., A thin layer (about 0.01-10 micrometers) of alkaline metals, such as caesium, calcium, strontium, and barium, or alkaline-earth metals may also be inserted under an Al layer (make the negative pole side into the upper part, and let the anode side be the bottom).

[0130]

The anode and the negative pole can be formed by publicly known methods, such as a vacuum deposition method, sputtering process, and the ion plating method. It is preferred to perform patterning of an electrode (especially electrode of a luminescence permeable material) by physical etching using chemical etching by photo lithography etc., laser, etc., etc. Vacuum deposition, sputtering, etc. may be performed in piles and a mask may be patterned.

[0131]

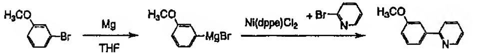
In this invention, a plastic plate other than the usual glass substrate can be used as a transparent substrate. A plastic used as a substrate needs to excel in heat resistance, dimensional stability, solvent resistance, electric insulation, processability, low breathability, and low moisture absorption. As such a plastic, polyethylene terephthalate, polyethylenenaphthalate, polystyrene, polycarbonate, polyether sulphone, polyarylate, polyimide, etc. are mentioned. A flexible organic light emitting element can be provided by using these flexible substrates. It is preferred to install a moisture permeation prevention layer (gas barrier layer) in a field by the side of an electrode of a substrate, a field of an electrode and an opposite hand, or a field of the both. As a material which constitutes a moisture permeation prevention layer, inorganic substances, such as silicon nitride and silicon oxide, are preferred. A moisture permeation prevention layer can be formed by a RF-sputtering method etc. A hard court layer and an undercoat layer may be provided if needed.

[0132]

As a method of forming organic polymer layers, such as a phosphorescence luminescence compound, electron-transport-property polymers, and hole transportability polymers, Although a spin coat method from a solution is common and print processes, the ink jet method, a spray method, the dispenser method, etc. can be mentioned as a method that an organic polymer layer of a large area can be manufactured simple in addition to this, it is not limited to these at all. Thereby, in a display which consists of an organic light emitting element of this invention, each

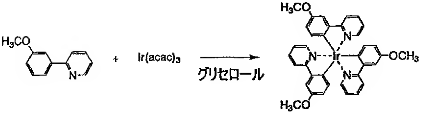
pixel of a display screen can apply an organic high polymer for every pixel, and an exception can kick, and it can make a display screen of a display full color. Especially the ink jet method can perform easily full color-ization of ** according to coating for every pixel of this, and a display screen.
[0133]
In a display which consists of an organic light emitting element of this invention, each pixel of a display screen arranges two or more transistors for every pixel, and a display of an active matrix system can be provided by an address of a pixel and a drive with these transistors. A piece is a transistor for a drive which injects current into an organic light emitting element which constitutes a pixel among two indispensable transistors, and other pieces are transistors for a change which control ON and OFF of current injection to this transistor for a drive. Application to a plastic plate is also attained by furthermore using these transistors as an organic transistor.

[0134]
[Example]
The example of the phosphorescence luminescence compound of this invention and its synthetic method are explained below. These examples are mere illustration for explanation, and this invention is not restricted to these examples.
[0135]
The monomer of a phosphorescence luminescence compound: (Example 1-1) Composition of [2-(3-methacrylic phenyl) pyridine] screw [2-(3-propionylphenyl) pyridin] iridium (III) (it abbreviates to Ir(MPPy) (PrCOPPy) $_2$ hereafter)
First, 2-(3-methoxypheny) pyridine (MeOPPy) was compounded in accordance with the conventional method of a scheme (1).
[0136]
[Formula 12]



(1)

Specifically, 3-methoxypheny magnesiumbromide was compounded for 8.98 g (48mmol) of 3-bromoanisoles using Mg in 60 ml of drying tetrahydrofurans (THF). In the solution which dissolved 6.32 g (40mmo1) of 2-bromopyridine, and 0.74 g of [1,2-bis(diphenylphospino)ethane] dichloronickel (0) (nickel(dppe) Cl_2) in drying THF40ml. 3-methoxypheny magnesiumbromide obtained previously was added and 6.03g (32.4mmol) of water-white 2-(3-methoxypheny) pyridine (MeOPPy) was obtained by making it react at a room temperature for 12 hours. Identification was performed by CHN ultimate analysis, NMR, and IR.
[0137]
Next, as shown in a scheme (2), MeOPPy and tris(acetylacetonate) iridium (III) (Ir(acac) $_3$) which were obtained by a scheme (1), It was made to react at an elevated temperature and tris(2-(3-methoxypheny) pyridine) iridium (III) (Ir(MeOPPy) $_3$) was compounded.
[0138]
[Formula 13]



(2)

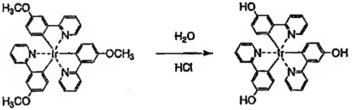
By making MeOPPy0.50g (2.70mmol) and Ir(acac)$_3$ 0.20g (0.41mmol) react at 250 ** among 20 ml of glycerol for 9 hours, and specifically refining in a column, Ir(MeOPPy)$_3$ 0.020g (0.027mmol) was obtained as fluorescence yellow powder. Identification was performed by CHN and Ir ultimate analysis, and IR.

[0139]

In accordance with the conventional method of a scheme (3), the MeO basis was hydrolyzed in the hydrochloric acid aqueous solution, Ir(MeOPPy)$_3$ obtained by the scheme (2) was made into the OH radical, and powdered tris(2-(3-hydroxyphenyl) pyridine) iridium (III) (Ir(HOPPy)$_3$) was obtained.

[0140]

[Formula 14]

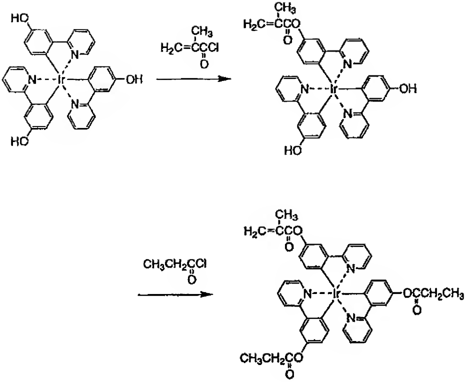


(3)

The complex which makes a part of OH radical make it methacrylic and in which Ir(MPPy)(HOPPy)$_2$ serves as the main ingredients was compounded by making Ir(HOPPy)$_3$ obtained by the scheme (3) react to an methacrylic acid chloride by the mole ratio 1:1 according to a scheme (4). Subsequently, the remaining OH radicals were made to react to propionic acidchloride (PrCOCl), and Ir(MPPy) (PrCOPPy)$_2$ obtained the complex used as the main ingredients.

[0141]

[Formula 15]


(4)

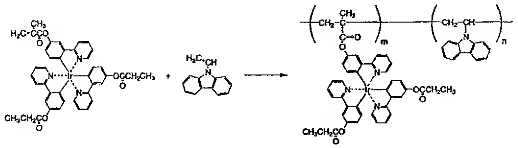
To a reaction vessel, specifically Drying THF8ml, Ir(HOPPy) $_3$ 0.706g (1mmol), After putting in 0.600 g (5.9mmo1) of triethylamine as a deoxidizer, the solution which dissolved 0.106 g (1mmol) of methacrylic acid chlorides in drying THF4ml was dropped over 30 minutes, and it was made to react at 20 ** for 5 hours. The solution which dissolved 0.370 g (4mmol) of propionic acidchloride in drying THF4ml further was dropped at this reaction solution over 30 minutes, by making it react at 20 ** for 5 hours, the remaining OH radicals were made to react and the ** exception carried out the hydrochloride of triethylamine. The formed element obtained by evaporating the solvent of filtrate to dryness was refined by performing recrystallization twice with chloroform / methanol mixed solvent, and Ir(MPPy) (PrCOPPy) $_2$ 0.523g (0.59mmol) made into the purpose was obtained as powder. Identification of this complex was performed by the ultimate analysis of CHN and Ir, and IR.

[0142]

(Example 1-2) Phosphorescence luminescence compound : [2-(3-methacrylic phenyl) pyridine] screw [2-(3-propionylphenyl) pyridin] iridium (III) / N-vinylcarbazole copolymer. Composition of (abbreviating to an Ir(MPPy) (PrCOPPy) $_2$/VCz copolymer hereafter)

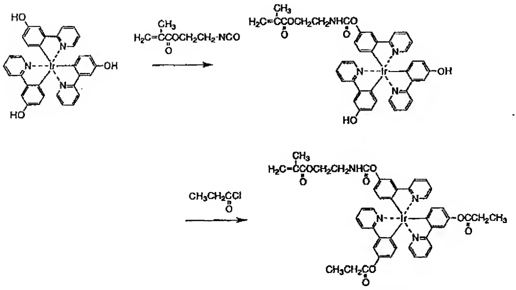
The Ir(MPPy) (PrCOPPy) $_2$ complex 0.222g (0.25mmol) compounded in Example 1 to a reaction vessel according to a scheme (5), 0.918 g (4.75mmol) (Ir(MPPy) (PrCOPPy) $_2$ and VCz are 5:95 at a mole ratio) of N-vinylcarbazole (VCz), After putting in 0.010 g (0.061mmol) of 2,2'-azobis (isobutyronitrile) (azobisuisobutironitoriru), and 10 ml of butyl acetate and performing a nitrogen purge, it was made to react at 80 ** for 10 hours.

[0143]
[Formula 16]



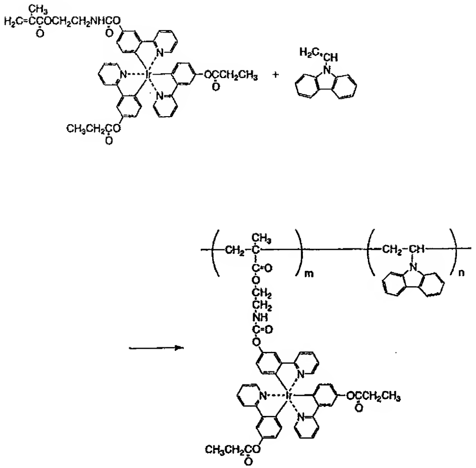
(5)

It reprecipitated by having thrown output into acetone after the reaction, and filtration recovered the copolymer. It refined by performing throwing in the chloroform fluid of the collected copolymer in methanol, and making it reprecipitate twice [further], vacuum drying was carried out after precipitate recovery, and the Ir(MPPy) (PrCOPPy) $_2$/VCz copolymer 0.946g made into the purpose was obtained as powder. The ultimate analysis of CHN and Ir of the obtained copolymer was supporting that Ir(MPPy) (PrCOPPy) $_2$ and VCz were carrying out copolymerization by the mole ratio of 5:95. Namely, repetition number [of repetition number m / carrier transport nature unit of a phosphorescence luminescence unit] n = it is thought that it is 5/95. GPC in chloroform of a copolymer to weight average molecular weight was 12000 in polystyrene conversion (the degree of polymerization of the average calculated from weight average molecular weight is 37). It is still more nearly meltable to organic solvents, such as chloroform, in the phosphorescence luminescence compound of this invention.
[0144]
(Example 1-3) A trial production of an organic light emitting element
Chloroform fluid of an Ir(MPPy) (PrCOPPy) $_2$/VCz copolymer and an oxadiazole derivative (tBu-PBD) which is electron transport materials was prepared. As for a ratio, an Ir(MPPy) (PrCOPPy) $_2$/VCz copolymer made tBu-PBD 35 mass percents to 65 mass percents. On a glass substrate in which tin-oxide indium (ITO) which is a transparent electrode attached this solution, the spin coat was carried out, a 100-nm-thick film was formed, on it, 10 nm and 100 nm of aluminum were vapor-deposited with a vacuum deposition method, and Ca was used as the negative pole. When negative voltage was impressed to the ITO side of this organic light emitting element at the aluminum positive side, green luminescence resulting from an iridium complex was observed. Light quantity child efficiency was about 4%.
[0145]
(Example 2-1) A monomer of a phosphorescence luminescence compound : {2-[3-(2-methacryloiloxy-ethyl) carbamoyloxy phenyl] pyridine} screw [2-(3-propionylphenyl) pyridin] iridium (III). Composition of (abbreviating to Ir(MiPPy) (PrCOPPy) $_2$ hereafter)
As shown in a scheme (6), intermediate Ir(HOPPy) $_3$ of a monomer compounded in Example 1-1, Made it react to methacryloiloxy-ethyl isocyanate (MOI, Showa Denko make) by 1:1, subsequently the remaining OH radicals were made to react to PrCOCl, and Ir(MiPPy) (PrCOPPy) $_2$ obtained a complex used as the main ingredients.
[0146]
[Formula 17]



(6)

Drying THF8ml, Ir(HOPPy) $_3$ 0.706g (1mmol), and MOI0.106g (1mmol) were put into the reaction vessel, and it was made to specifically react at 20 ** for 5 hours. After adding 0.600 g (5.9mmo1) of triethylamine to this reaction solution as a deoxidizer, By dropping the solution made to dissolve 0.370 g (4mmol) of propionylchloride in drying THF4ml over 30 minutes, and also making it react at 20 ** for 5 hours, the remaining OH radicals were made to react and the ** exception carried out the hydrochloride of triethylamine. The formed element obtained by evaporating the solvent of filtrate to dryness was refined by performing recrystallization twice with chloroform / methanol mixed solvent, and Ir(MiPPy) (PrCOPPy) $_2$ 0.613g (0.63mmol) made into the purpose was obtained as powder. This identification was performed by the ultimate analysis of CHN and Ir, and IR.
[0147]
Phosphorescence luminescence compound: (Example 2-2) [2-[3-(2-methacryloiloxy-ethyl) carbamoyloxy phenyl] pyridine] screw [2-(3-propionylphenyl) pyridin] iridium (III) / N-vinylcarbazole copolymer (hereafter) Composition abbreviated to an Ir(MiPPy) (PrCOPPy) $_2$/VCz copolymer
The Ir(MiPPy) (PrCOPPy) $_2$ complex 0.243g (0.25mmol) compounded in Example 3 to a reaction vessel according to a scheme (7), 0.918 g (4.75mmol) (Ir(MiPPy) (PrCOPPy) $_2$ and VCz are 5:95 at a mole ratio) of N-vinylcarbazole (VCz), After putting in 0.010 g (0.061mmol) of 2,2'-azobis (isobutyronitrile) (azobisuisobutironitoriru), and 10 ml of butyl acetate and performing a nitrogen purge, it was made to react at 80 ** for 10 hours.
[0148]
[Formula 18]



(7)

It reprecipitated by having supplied to acetone after the reaction, and filtration recovered the copolymer. It refined by performing throwing in the chloroform fluid of the collected copolymer in methanol, and making it reprecipitate twice [further], vacuum drying was carried out after precipitate recovery, and the Ir(MiPPy) (PrCOPPy) $_2$/VCz copolymer 1.053g made into the purpose was obtained as powder. It was supporting that Ir(MiPPy) (PrCOPPy) $_2$ and VCz were carrying out copolymerization of the ultimate analysis of CHN and Ir of the obtained copolymer by the mole ratio of 5:95. Namely, repetition number [of repetition number m / carrier transport nature unit of a phosphorescence luminescence unit] n = it is thought that it is 5/95. GPC in chloroform of a copolymer to weight average molecular weight was 23000 in polystyrene conversion (the degree of polymerization of the average calculated from weight average molecular weight is 64). It is still more nearly meltable to organic solvents, such as chloroform, in the phosphorescence luminescence compound of this invention.
[0149]
(Example 2-3) A trial production of an organic light emitting element

An Ir(MiPPy) (PrCOPPy) $_2$/VCz copolymer and chloroform fluid of tBu-PBD were prepared. As for a ratio, an Ir(MiPPy) (PrCOPPy) $_2$/VCz copolymer made tBu-PBD 35 mass percents to 65 mass percents. On a glass substrate in which ITO attached this solution, the spin coat was carried out, a 100-nm-thick film was formed, on it, 10 nm and 100 nm of aluminum were vapor-deposited with a vacuum deposition method, and Ca was used as the negative pole. When negative voltage was impressed to the ITO side of this organic light emitting element at the aluminum positive side, green luminescence resulting from an iridium complex was observed. Light quantity child efficiency was about 3%.

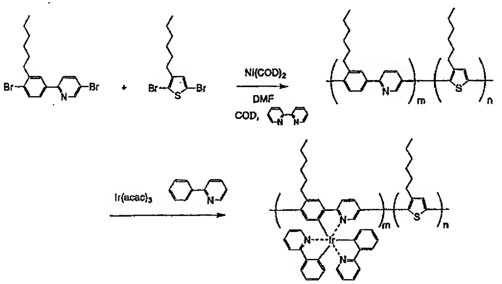
[0150]

Phosphorescence luminescence compound: (Example 3-1) Composition of a [2-(3-hexylphenyl) pyridine] bis(2-phenylpyridine)iridium (III)/3-hexylthiophene copolymer (it abbreviates to Ir(HPPy) PPy_2 / HT copolymer hereafter)

As shown in a scheme (8), 5-bromo-2-. (4-bromo-3-hexylphenyl) Pyridine. ($HPPyBr_2$) In accordance with a conventional method, 0.099 g (0.25mmol) and 1.549 g (4.75mmol ($HPPyBr_2$)) (($HTBr_2$) is 5:95 at a mole ratio) of 3-hexyl-2,5-dibromothiophenes ($HTBr_2$), Copolymerization was carried out in 10 ml of dimethylformamide (DMF) with nickel(COD) $_2$ (0) (however, COD shows cycloocta dienyl group) catalyst, and 2-(3-hexylphenyl) pyridine / 3-hexylthiophene copolymer (HPPy/HT copolymer) was compounded. Next, this HPPy/HT copolymer 0.625g (4mmol) and Ir(acac) $_3$ 0.099g (0.2mmol) were dissolved in metacresol, and it was made to react at 250 ** for 10 hours. 0.062 g (0.4mmol) was added to this solution, and phenylpyridine (PPy) was made to react to it at 250 ** furthermore for 10 hours.

[0151]

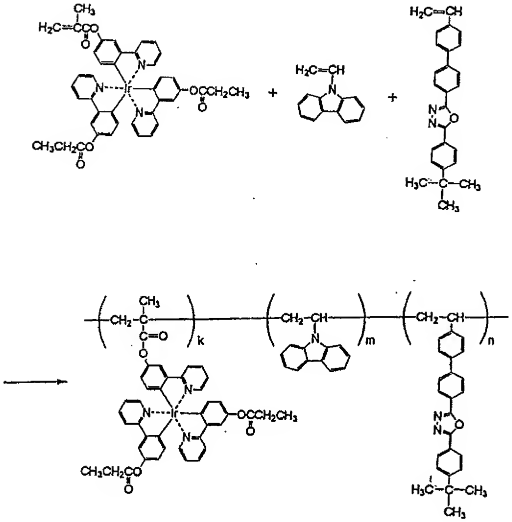
[Formula 19]



(8)

It reprecipitated by having supplied to acetone after the reaction, and filtration recovered the copolymer. It refined by reprecipitating twice [further] by throwing in the DMF solution of the collected copolymer in acetone, vacuum drying was carried out after precipitate recovery, and Ir (HPPy) PPy_2 / HT copolymer 0.564g made into the purpose were obtained as powder.

[0152]
The ultimate analysis of CHN and Ir of a copolymer was supporting presumed structure. Namely, repetition number [of repetition number m / carrier transport nature unit of a phosphorescence luminescence unit] n = it is thought that it is 5/95. GPC of the copolymer in hexafluoro isopropanol to weight average molecular weight was 18000 in polystyrene conversion (the degree of polymerization of the average calculated from weight average molecular weight is 68). It is still more nearly meltable to organic solvents, such as DMF, in the phosphorescence luminescence compound of this invention.
[0153]
(Example 3-2) The trial production of an organic light emitting element
Ir(HPPy) PPy_2 / HT copolymer, and the chloroform fluid of tBu-PBD were prepared. As for the ratio, Ir(HPPy) PPy_2 / HT copolymer made tBu-PBD 35 mass percents to 65 mass percents. On the glass substrate in which ITO attached this solution, the spin coat was carried out, the 100-nm-thick film was formed, on it, 10 nm and 100 nm of aluminum were vapor-deposited with the vacuum deposition method, and Ca was used as the negative pole. When negative voltage was impressed to the ITO side of this organic light emitting element at the aluminum positive side, yellow luminescence resulting from an iridium complex was observed. Light quantity child efficiency was about 1%.
[0154]
A monomer of an electron-transport-property compound: (Example 4-1) Composition of 2-(4-tert-butyl-phenyl)-(4'-vinyl-biphenyl 4-yl)-[1, 3, 4] oxadiazole (it abbreviates to VPBD hereafter.)
VPBD was compounded in accordance with a method currently indicated by JP,10-1665,A.
[0155]
(Example 4-2) Phosphorescence luminescence compound : [2-. (3-methacrylic phenyl) Pyridine] screw [2-. (3-propionylphenyl) Pyridine] iridium (III)/N-vinylcarbazole / 2-(4-tert-butyl-phenyl)-5-(4'-vinyl-biphenyl 4-yl)-[1, 3, 4] oxadiazole copolymer (hereafter) It abbreviates to an Ir (MPPy) (PrCOPPy) $_2$/VCz/VPBD copolymer. Composition
The Ir(MPPy) (PrCOPPy) $_2$ complex 0.222g (0.25mmol) compounded in Example 1-1 according to the following scheme (9), VCz0.628g (3.25mmol), VPBD0.571g (1.50mmol) (a mole ratio is Ir (MPPy) (PrCOPPy) $_2$:VCz:VPBD=5:65:30) compounded in above-mentioned Example 4-1, After putting 0.010 g (0.061mmol) of 2,2'-azobis (isobutyronitrile) (azobisuisobutironitoriru), and 10 ml of benzene into a reaction vessel and performing a nitrogen purge, it was made to react at 80 ** for 10 hours.
[0156]
It reprecipitated by having thrown output into acetone after a reaction, and filtration recovered a copolymer. It refined by performing throwing in chloroform fluid of a collected copolymer in methanol, and making it reprecipitate twice [further], vacuum drying was carried out after precipitate recovery, and the Ir(MPPy) (PrCOPPy) $_2$/VCz/VPBD copolymer 0.080g made into the purpose was obtained as powder.
[0157]
[Formula 20]



(9)

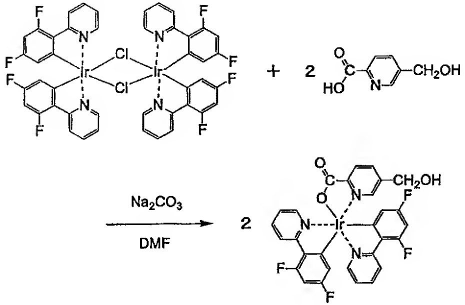
The ultimate analysis of CHN and Ir of the obtained copolymer (phosphorescence luminescence compound) was supporting that the mole ratio was carrying out copolymerization by Ir(MPPy)(PrCOPPy) $_2$:VCz:VPBD=5:65:25. That is, it is thought that it is (repetition number [of a phosphorescence luminescence unit]:k)/(repetition number m+n of carrier transport unit) =5/90. The weight average molecular weight of GPC in chloroform of a copolymer to the copolymer was 30000 in polystyrene conversion (the degree of polymerization of the average calculated from weight average molecular weight is 2.5). In this copolymer, it is meltable to organic solvents, such as chloroform.

[0158]

(Example 4-3) A trial production of an organic light emitting element

Chloroform fluid of an Ir(MPPy) (PrCOPPy) $_2$/VCz/VPBD copolymer obtained in Example 4-2 was prepared. On a glass substrate to which tin-oxide indium (ITO) which is a transparent electrode was attached in this solution, the spin coat was carried out and a 100-nm-thick film

was formed, and 10 nm and 100 nm of aluminum were vapor-deposited for Ca with a vacuum deposition method on it, it was considered as the negative pole, and an organic light emitting element was obtained. The ITO side of this organic light emitting element was made positive, and when voltage was impressed by making the aluminum side negative, green luminescence resulting from an iridium complex was observed. Light quantity child efficiency was about 3%.
[0159]
Electron-transport-property high molecular compound: (Example 5-1) Polly's VPBD (it abbreviates to PVPBD hereafter.) composition
PVPBD was compounded in accordance with a method currently indicated by JP,10-1655,A.
[0160]
(Example 5-2)
An Ir(MPPy) (PrCOPPy) $_2$/VCz copolymer obtained in Example 1-2 and chloroform fluid of PVPBD obtained in Example 5-1 were prepared. As for a ratio, an Ir(MPPy) (PrCOPPy) $_2$/VCz copolymer made PVPBD 35 % of the weight to 65 % of the weight. On a glass substrate to which tin-oxide indium (ITO) which is a transparent electrode was attached in this solution, the spin coat was carried out and a 100-nm-thick film was formed, and 10 nm and 100 nm of aluminum were vapor-deposited for Ca with a vacuum deposition method on it, it was considered as the negative pole, and an organic light emitting element was obtained. The ITO side of this organic light emitting element was made positive, and when voltage was impressed by making the aluminum side negative, green luminescence resulting from an iridium complex was observed. Light quantity child efficiency was about 4.5%.
[0161]
(Example 6-1) A monomer:iridium (III) screw (2-(2,4-difluorophenyl) pillage NATO) (5-METAKURIRO yloxy methyl PIKORINATO) which has a blue phosphorescence luminescence part. It abbreviates to (less or equal and Ir(2, 4-F-ppy) $_2$ (5-CH_2MA-pic). Composition which is)
As shown in a scheme (10), an iridium (III) screw (2-(2,4-difluorophenyl) pillage NATO) (5-(hydroxymethyl) pico RINATO) (it abbreviates to Ir(2, 4-F-ppy) $_2$ (5-CH_2OH-pic) hereafter.) was compounded. Namely, [Ir(2, 4-F-ppy) $_2$Cl] $_2$121.6mg (0.1mmol), Under an argon air current, 10 ml of drying N.N-dimethylformamide was added to 45.9 mg (0.3mmol) of 5-hydroxymethylpicolinic acid, and 106.0 mg (1.0mmol) of sodium carbonate, and it stirred at 80 ** for 2 hours. Ethyl acetate extracted, after adding 50 ml of water to reaction mixture. The solution was condensed after desiccation with magnesium sulfate, and column chromatography (silica gel, methanol: chloroform =1:19 (volume ratio)) refined it. Ir(2, 4-F-ppy) $_2$(5-CH_2OH-pic) 108.7mg was obtained as a yellow crystal by furthermore recrystallizing it from hexane/chloroform. 75% of yield. Identification was performed by ^{1}H-NMR and CHN ultimate analysis. ^{1}H-NMR (270 MHz, DMSO-d_6), ppm: 8.54 (d, 1H, J= 4.6) and 8.3 - 8.2 (m, 2H), 8.1 - 8.0 (m, 4H), 7.70 (s, 1H), 7.61 (d, 1H, J= 4.9), 7.49 (dd, 1H, J= 6.6, .6.6), 7.32 (dd, 1H, J= 6.6, .6.6), 6.9 - 6.7 (m, 2H), 5.71 (dd, 1H, J= 8.9, 2.4), 5.46 (dd, 1H, J= 8.5, 2.3), 5.42 (t, 1H, J= 4.6), 4.49(d,2H,J=4.6). Anal. Found: C 48.05, H 2.54, N 5.86. Calcd: C 48.06, H 2.50, N 5.80.
[0162]
[Formula 21]

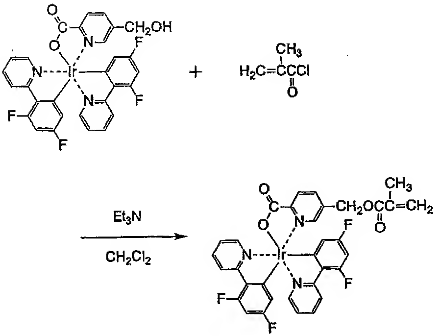


(10)

Subsequently, as shown in a scheme (11), Ir(2, 4-F-ppy) $_2$ (5-CH_2MA-pic) was compounded. Namely, Ir(2,4-F-ppy) $_2$ (5-CH_2OH-pic) 72.5 mg (0.1mmol) and 0.2 mg of 2,6-di-tert-4-methyl phenol are dissolved in 10 ml of drying dichloromethane under an argon air current, 101.2 mg (1.0mmol) of triethylamine and 52.3 mg (0.5mmol) of methacrylic acid chloride were added, and it stirred at the room temperature for 2 hours. 50 ml of water was added to reaction mixture, and chloroform extracted. The solution was condensed after desiccation with magnesium sulfate, and column chromatography (silica gel, methanol: chloroform =3:97 (volume ratio)) refined it. It is Ir(2, 4-F-ppy) $_2$ (5-CH_2MA-pic) as a yellow crystal by furthermore recrystallizing it from hexane/chloroform. 70.6 mg was obtained. 89% of yield. Identification was performed by ^{1}H-NMR and CHN ultimate analysis. ^{1}H-NMR (270 MHz, DMSO-d_6), ppm: 8.53 (d, 1H, J= 5.1), 8.28 (d, 1H, J= 8.4), 8.22 (d, 1H, J= 8.6) and 8.1 - 8.0 (m, 4H), 7.70 (s, 1H), 7.66 (d, 1H, J= 4.9), 7.48 (dd, 1H, J= 6.5, .6.5), 7.31 (dd, 1H, J= 6.5, .6.5) and 6.9 - 6.7 (m, 2H), 5.84 (s, 1H) and 5.7 - 5.6 (m, 2H), 5.47 (dd, 1H, J= 8.8, 2.6), 5.24(d,2H,J=2.7), 1.78(s,3H). Anal. Found: C 49.92, H 2.87, N 5.28. Calcd: C 50.00, H 2.80, N 5.30.

[0163]

[Formula 22]

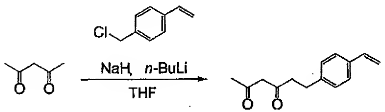


(11)

The monomer which has a green phosphorescence luminescence part: (Example 6-2) Composition of [6-(4-vinylphenyl)-2,4-hexane dionate] bis(2-phenylpyridine)iridium (III) (it abbreviates to Ir(ppy) $_2$ [1-(StMe)-acac] below)

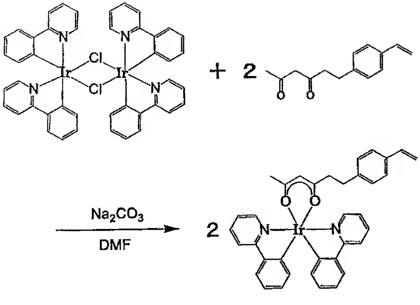
As shown in a scheme (12), 4-vinylbenzyl chloride was made to react to an acetylacetone, and 6-(4-vinylphenyl)-2,4-hexadione was compounded. That is, weighing of the sodium hydride 1.23g (60% in oil) (31mmol) was carried out under a nitrogen atmosphere, 60 ml of dry tetrahydrofurans (it omits the following THF) were added to this, and it cooled at 0 ** by the ice bath. When the mixed solution of 2.5 g (24mmol) of acetylacetones and 1 ml of hexamethylphosphoric triamide was dropped at this suspension, colorless precipitate generated. After stirring for 10 minutes at 0 **, when 17.5 ml (28mmol) of hexane solutions (1.6M) of n-butyl lithium were dropped, precipitate dissolved, and also it stirred for 20 minutes at 0 **. 4.0 g (26mmol) of 4-vinylbenzyl chloride was dropped at the obtained solution of thin yellow, reaction mixture was returned to the room temperature, for 20 minutes, after stirring, dilute hydrochloric acid was added and the water layer was made into acidity. The saturation sodium chloride aqueous solution washed the organic layer, and after drying with magnesium sulfate, the solvent was distilled off by the rotary evaporator. The obtained reaction mixture was added to the silica gel column, it developed with 1:1 (volume ratio) mixed solvent of hexane/dichloromethane, and the main output was isolated preparatively. By distilling a solvent out of the obtained solution under reduced pressure, 3.0 g (14mmol) of 6-(4-vinylphenyl)-2,4-hexadione made into the purpose was obtained as a brown fluid. 56% of yield. Identification was performed by CHN ultimate analysis and ^{1}H-NMR. ^{1}H NMR : ($CDCl_3$) enol; d 7.33 (d, J= 8.1 Hz, 2H, aromatic), (d, J= 8.4 Hz, 2H, aromatic) 7.14 6.68 (dd, J= 8.1 Hz, 1H, vinylic), (d, J= 17.0 Hz, 1H, vinylic) 5.70 5.46 (s, 1H, diketonate-methine), (d, J= 11.1 Hz, 1H, vinylic) 5.20 2.91 (t, J= 5.7 Hz, 2H, methylene), 2.58 (t, J= 7.3 Hz, 2H, methylene) 2.03(s, 3H, methyl). keto; d 7.33 (d, J= 8.1 Hz, 2H, aromatic), (d, J= 8.4 Hz, 2H, aromatic) 7.14 6.68 (dd, J= 8.1 Hz, 1H, vinylic), 5.70 (d, J= 17.0 Hz, 1H, vinylic) 5.20 (d, J= 11.1 Hz, 1H, vinylic), 3.53 (s, 2H, C

(=O) CH_2C (=O)), and 2.89 (m and 4H -- ethy.) lene, 2.19. (s, 3H, methyl) enol : keto = 6 : 1. E.A.: Calcd for$C_{14}H_9O_2$: C, 77.75; H, 7.46. Found: C, 77.49; H, 7.52.
[0164]
[Formula 23]



(12)

Subsequently, as shown in a scheme (13), [Ir(ppy) $_2$Cl] $_2$ compounded in accordance with the conventional method was made to react to this 6-(4-vinylphenyl)-2,4-hexane dione, and Ir(ppy) $_2$ [1-(StMe)-acac] was compounded. Namely, [Ir(ppy) $_2$Cl] $_2$342mg (0.32mmol), 158 mg (1.5mmol) of sodium carbonate and 5 mg (0.023mmol) of 2,6-di-tert-butyl-4-methyl phenol are dissolved in the N.N-dimethylformamide (it abbreviates to DMF below) of 5 ml, 210 mg (0.97mmol) of 6-(4-vinylphenyl)-2,4-hexane dione was added to this, and heating stirring was carried out at 65 ** for 1 hour. Next, after adding dilute-hydrochloric-acid solution to the reaction solution cooled to the room temperature, chloroform extracted the ingredient of thin yellow. Residue was dissolved in a little dichloromethanes after distilling off a solvent using the rotary evaporator, and the yellow main output was isolated preparatively with silica gel column chromatography (developing solution: dichloromethane). Decompression hardening by drying of this solution was carried out, the dichloromethanehexane mixed solution was added, recrystallization was performed at -20 **, and Ir(ppy) $_2$[1-(StMe)-acac]354mg (0.49mmol) made into the purpose was obtained as a thin yellow crystal. 78% of yield. Identification was performed by CHN ultimate analysis and ^{1}H-NMR. ^{1}H NMR : ($CDCl_3$) d 8.47 (d, J= 5.7 Hz, 1H, ppy), 8.21 (d, J= 5.7 Hz, 1H, ppy) 7.9 - 7.5 (m, 6H, ppy), 7.18 (d, J= 8.1 Hz, 2H, stylyl-aromatic). (m, 2H, ppy) 7.00 6.89 (d, J= 8.1 Hz, 2H, stylyl-aromatic), (m, 5H, ppy and vinylic) 6.75 6.28 (t, J= 7.3 Hz, 2H, ppy), (d, J= 17.6 Hz, 1H, vinylic) 7.67 5.19 (d, J= 9.5 Hz, 1H, vinylic), 5.17 (s, 1H, diketonate-methine). 2.60 (t, J= 7.3 Hz, 2H, ethylene) and 2.36 (m, 2H, ethylene), 1.75 (s, 3H, methyl) .E.A.: Calcd for $C_{36}H_{31}IrN_2O_2$: C, 60.40; H, 4.36; N, 3.91. Found: C, 61.35; H, 4.34; N. , 3.83.
[0165]
[Formula 24]

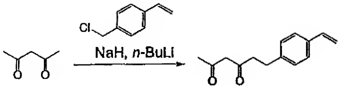


(13)

The monomer which has a red phosphorescence luminescence part: (Example 6-3) Composition of [6-(4-vinylphenyl)-2,4-hexane dionate] screw [2-(2-pyridyl) benzo thienyl] iridium (III) {it abbreviates to Ir(btp) $_2$ [1-(StMe)-acac] below}

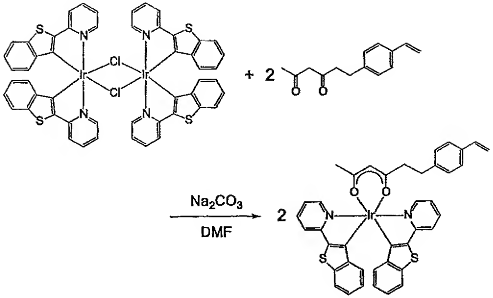
As shown in a scheme (14), 4-vinylbenzyl chloride was made to react to an acetylacetone, and 6-(4-vinylphenyl)-2,4-hexane dione was compounded. That is, weighing of the sodium hydride 1.23g (60% in oil) (31mmol) was carried out under a nitrogen atmosphere, 60 ml of dry tetrahydrofurans (it omits the following THF) were added to this, and it cooled at 0 ** by the ice bath. When the mixed solution of 2.5 g (24mmol) of acetylacetones and 1 ml of hexamethylphosphoric triamide (it omits the following HMPA) was dropped at this suspension, colorless precipitate generated. After agitating for 10 minutes at 0 **, when 17.5 ml (28 mol) of hexane solutions (1.6M) of n-butyl lithium were dropped, precipitate dissolved, and also it agitated for 20 minutes at 0 **. 4.0 g (26mmol) of 4-vinylbenzyl chloride was dropped at the obtained solution of thin yellow, reaction mixture was returned to the room temperature, for 20 minutes, after churning, dilute hydrochloric acid was added and the water layer was made into acidity. The saturation sodium chloride aqueous solution washed the organic layer, and after drying with magnesium sulfate, the solvent was distilled off by the rotary evaporator. The obtained reaction mixture was added to the silica gel column, it developed with 1:1 (volume ratio) mixed solvent of hexane/dichloromethane, and the main output was isolated preparatively. By distilling a solvent out of the obtained solution under reduced pressure, 3.0 g (14mmol) of 6-(4-vinylphenyl)-2,4-hexane dione made into the purpose was obtained as a brown fluid. 56% of yield. Identification was performed by CHN ultimate analysis and ^{1}H-NMR. ^{1}H NMR: enol; d 7.33 (d, J= 8.1 Hz, 2H, aromatic), (d, J= 8.4 Hz, 2H, aromatic) 7.14 6.68 (dd, J= 8.1 Hz, 1H, vinylic), (d, J= 17.0 Hz, 1H, vinylic) 5.70 5.46 (s, 1H, enol-methine), (d, J= 11.1 Hz, 1H, vinylic) 5.20 2.91 (t, J= 5.7 Hz, 2H, methylene), 2.58 (t, J= 7.3 Hz, 2H, methylene) 2.03. (s, 3H, methyl) keto; d 7.33 (d, J= 8.1 Hz, 2H, aromatic), (d, J= 8.4 Hz, 2H, aromatic) 7.14 6.68 (dd, J= 8.1 Hz, 1H, vinylic), 5.70 (d, J= 17.0 Hz, 1H, vinylic) 5.20 (d, J= 11.1 Hz, 1H, vinylic), 3.53 (s, 2H, C(=O) CH_2C (=O)), 2.89 (m, 4H, ethylene), and 2.19 (3H s) methyl. enol : keto = 6 : 1. E.A.: Calcd for $C_{14}H_9O_2$: C, 77.75; H, 7.46.

Found: C, 77.49; H, 7.52.
[0166]
[Formula 25]



(14)

Subsequently, as shown in a scheme (15), This 6-. (4-vinylphenyl)-2,4-hexane dione and a conventional method. (-- for example, S.Lamansky, et al., Inorganic Chemistry, and JI (mu-chloro) tetrakis (2-(2-pyridyl) benzo thienyl) JIIRIJIUMU (hereafter) compounded according to written) to 40,1704 (2001) [Ir(btp) $_2$ Cl] It abbreviates to $_2$. It was made to react and Ir(btp) $_2$ [1-(St-Me)-acac] was compounded. Namely, [Ir(btp) $_2$Cl] $_2$253mg (0.20mmol) is made suspended to 10 ml of N.N-dimethylformamide (it abbreviates to DMF below), 161 mg of 6-(4-vinylphenyl)-2,4-hexane dione (0.74mmol), 64 mg of sodium carbonate, and 1.9 mg of 2,6-di-tert-butyl-4-, Methyl phenol (it omits the following BHT) (0.0086mmol) was added, and heating churning was carried out at 80 ** for 1 hour. 100 ml of water and 50 ml of chloroform could be added to the obtained reaction mixture, it shook, and decompression hardening by drying of the organic layer was carried out by the rotary evaporator after desiccation with magnesium sulfate. Next, the silica gel column refined partially purified substance by having made dichloromethane into the eluate, and the reddish-brown solution was obtained. It condensed under decompression of this solution and Ir(btp) $_2$[1-(StMe)-acac]153mg (0.18mmol) made into the purpose was obtained as a reddish-brown solid by adding hexane and recrystallizing at -20 ** (47% of yield). Identification was performed by CHN ultimate analysis and ^{1}H-NMR. ^{1}H NMR: d 8.40 (d, J= 5.4 Hz, 1H, btp), (d, J= 5.4 Hz, 1H, btp) 7.97 7.65 (m, 6H, btp), 7.1 - 6.7 (m, 10H, aromatic) and 6.63 (dd, J= 17.8-11.1 Hz, 1H, vinylic), (d, J= 8.1 Hz, 1H, btp) 6.24 6.16 (d, J= 7.8 Hz, 1H, btp), (d, J= 17.8 Hz, 1H, vinylic) 5.65 5.22 (s, 1H, diketonate-methine), (d, J= 11.1 Hz, 1H, vinylic) 5.18 2.56 (m, 2H, ethylene), 2.37 (m, 2H, ethylene). (s, 3H, methyl) 1.75 . E.A.: Calcd for $C_{40}H_{31}IrN_2O_2S_2$: C, 58.02; H, 3.77; N, 3.38. Found: C, 57.79; H, 3.81; N, 3.55.
[0167]
[Formula 26]

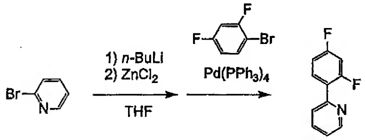


(15)

(Example 6-4) Composition of a white phosphorescence luminescence compound
The copolymer containing N-vinylcarbazole which has three kinds of monomers and the hole transportation function to have the luminescence function compounded in Example 6-1 to 6-3 was compounded.
[0168]
1.55 g (8.0mmol) of N-vinylcarbazole, Ir(2, 4-F-ppy) $_2$(3-ST-pic) 58.0mg (0.08mmol), Ir(ppy) $_2$ [1-(St-Me)-acac] 1.1 mg (0.0015mmol), Ir(btp) $_2$ [1-(StMe)-acac] 1.2 mg (0.0015mmol) and azobisuisobutironitoriru13mg (0.08mmol) were dissolved in 40 ml of drying toluene, and argon was blown for further 1 hour. Carried out temperature up of this solution to 80 **, the polymerization reaction was made to start, and it stirred as it is for 8 hours. After cooling, reaction mixture was dropped into 250 ml of methanol, polymer was settled, and filtration recovered. After refining by dissolving the collected polymer in 25 ml of chloroform, dropping this solution into 250 ml of methanol, and making it reprecipitate, 116.3 mg of white phosphorescence luminescence compounds which have three kinds of phosphorescence luminescence units which emit light in the blue, green, and red which are made into the purpose were obtained by carrying out vacuum drying at 60 ** for 12 hours.
[0169]
Content of an ultimate analysis result of Ir of an obtained copolymer (phosphorescence luminescence compound) to Ir complex (phosphorescence luminescence unit) was 1.07-mol%. GPC in chloroform of a copolymer to weight average molecular weight was 12400 in polystyrene conversion.
[0170]
(Example 6-5) A trial production of an organic light emitting element
It changed to an Ir(MPPy) (PrCOPPy) $_2$/VCz copolymer, and an organic light emitting element was made as an experiment like Example 1-3 except using a copolymer compounded in Example 6-2.
[0171]

When negative voltage was impressed to the ITO side of this organic light emitting element at the aluminum positive side, white luminescence was observed with the naked eye.
[0172]
An emission spectrum of an organic light emitting element is shown in drawing 3. A light emission peak corresponding to three kinds of phosphorescence luminescence units (blue, green, red) was observed by 480 nm, 520 nm, and 620 nm, respectively. Chromaticities of the luminescent color were (0.32, 0.33).
[0173]
(Example 7-1) A monomer:iridium (III) screw (2-(2,4-difluorophenyl) pillage NATO) (3-(4-vinylphenyl) methoxy pico RINATO) which has a blue phosphorescence luminescence part. It abbreviates to (less or equal and Ir(2, 4-F-ppy) $_2$ (3-ST-pic). Composition which is)

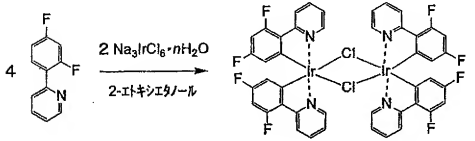
As shown in a scheme (16), 2-(2,4-difluorophenyl) pyridine was compounded. That is, under an argon air current, 8.69 g (55.0mmol) of 2-bromopyridine was dissolved in 200 ml of drying tetrahydrofurans, it cooled to -78 **, and 38.7 ml (61.9mmol) of hexane solutions of 1.6M n-butyl lithium were dropped over 30 minutes. A solution which dissolved the zinc chloride 7.5g (55.0mmol) in 50 ml of drying tetrahydrofurans (THF) further was dropped over 30 minutes after dropping. Carry out temperature up slowly to 0 ** after dropping, and the 1-bromo-2,4-difluorobenzene 9.65g (55.0mmol) and 2.31 g (2.0mmol) of tetrakis (triphenyl phosphine) palladium (0) are added, After stirring under flowing back for 6 hours, 200 ml of saturation salt solutions were added to reaction mixture, and it extracted with diethylether. 2-(2,4-difluorophenyl) pyridine was obtained as water-white oil by condensing and refining after drying an extract, with column chromatography (silica gel; chloroform : hexane =1:1 (volume ratio)). A yield of 6.00g. 63% of yield. Identification was performed by ^{1}H-NMR and CHN ultimate analysis. ^{1}H-NMR (270 MHz, $CDCl_3$), ppm: 8.71 (d, 1H, J= 4.6 Hz), 8.00 (td, 1H, J= 8.9, 6.5 Hz), 7.8 - 7.7 (m, 2H) and 7.3 - 7.2 (over wrapped with $CHCl_3$, 1H), 7.1 - 6.8(m,2H). Anal.Found: C 68.98, H 3.80, N 7.31. Calcd: C 69.11, H 3.69, N 7.33.
[0174]
[Formula 27]



(16)

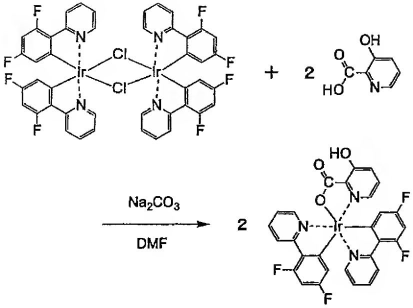
Subsequently, as shown in a scheme (17), 2 core complex of iridium and bis(mu-chloro)tetrakis (2-(2,4-difluorophenyl) pyridine) JIIRIJIUMU (III) (it abbreviates to [Ir(2, 4-F-ppy) $_2$Cl] $_2$ hereafter.) were compounded. Namely, 0.96 g (5.0mmol) of 2-(2,4-difluorophenyl) pyridine and 1.00 g of hexachloroiridium (III) acid sodium n hydrates (made by Wako Pure Chemical Industries) are dissolved in 40 ml of mixed solvents of 2-ethoxyethanol:water =3:1, After blowing argon gas

for 30 minutes, it stirred under flowing back for 5 hours. [Ir(2, 4-F-ppy) $_2$Cl] $_2$ was obtained as yellow powder by ****(ing) formed precipitate, and ethanol and a small amount of acetone washing, and drying under a vacuum for 5 hours. The yield of 0.79g. 86% of yield. Identification was performed by ^{1}H-NMR and CHN ultimate analysis. ^{1}H-NMR (270 MHz, $CDCl_3$), ppm: 9.12 (d, 4H, J= 5.7 Hz), 8.31 (d, 4H, J= 8.6 Hz), 7.83 (dd, 4H, J= 7.6, 7.6 Hz), 6.82 (dd, 4H, J= 7.3, 7.3 Hz), 6.34 (ddd, 4H, J= 11.6, 10.0, 2.4 Hz), 5.29(dd,4H,J=9.5,2.4Hz). Anal. Found: C 43.69, H 3.53, N 3.54. Calcd: C 43.88, H 3.45, N3.56.
[0175]
[Formula 28]



(17)

Subsequently, as shown in a scheme (18), the iridium (III) screw (2-(2,4-difluorophenyl) pillage NATO) (3-hydroxy pico RINATO) (it abbreviates to Ir(2, 4-F-ppy) $_2$ (3-OH-pic) hereafter.) was compounded. Namely, [Ir(2, 4-F-ppy) $_2$Cl] $_2$121.6mg (0.1mmol), Under the argon air current, 10 ml of drying N.N-dimethylformamide (DMF) was added to 41.7 mg (0.3mmol) of 3-hydroxypicolinic acid, and 106.0 mg (1.0mmol) of sodium carbonate, and it stirred at 80 ** for 2 hours. Ethyl acetate extracted, after adding 50 ml of water to reaction mixture. The solution was condensed after desiccation with magnesium sulfate, and column chromatography (silica gel, methanol: chloroform =3:97 (volume ratio)) refined it. Ir(2, 4-F-ppy) $_2$(3-OH-pic) 101.0mg was obtained as a yellow crystal by furthermore recrystallizing it from hexane/chloroform. 71% of yield. Identification was performed by ^{1}H-NMR and CHN ultimate analysis. ^{1}H-NMR (270 MHz, DMSO-d_6), ppm: 13.6 (br, 1H), 8.50 (d, 1H, J= 5.9 Hz), 8.25 (d, 2H, J= 11.1 Hz) and 8.1 - 8.0 (m, 2H), 7.69 (d, 1H, J= 5.7 Hz), 7.62 (d, 1H, J= 8.1 Hz), 7.53 (d, 1H, J= 4.6 Hz), 7.50 (d, 1H, J= 5.7 Hz), 7.36 (t, 1H, J= 4.5 Hz), 7.24 (d, 1H, J= 5.1 Hz), 6.9 - 6.7 (m, 2H), 5.66 (dd, 1H, J= 8.6, 2.4 Hz), 5.48 (dd,1H,J=8.6,2.4Hz). Anal. Found: C 47.29, H 2.33, N 5.86. Calcd: C 47.32, H 2.27, N 5.91.
[0176]
[Formula 29]

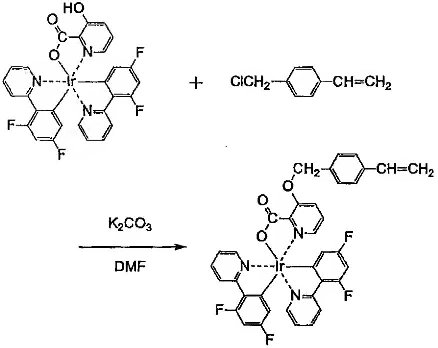


(18)

Subsequently, as shown in a scheme (19), Ir(2, 4-F-ppy) $_2$ (3-ST-pic) was compounded. Namely, Ir(2, 4-F-ppy) $_2$(3-OH-pic) 106.5mg (0.15mmol), Under an argon air current, 15 ml of drying N.N-dimethylformamide is added to 207.3 mg (1.5mmol) of potassium carbonate, and 0.3 mg of 2,6-di-t-butylhydroxytoluene, 91.5 mg (0.6mmol) of 4-vinylbenzyl chloride was added to the pan, and it stirred at 80 ** for 4 hours. add 100 ml of water to reaction mixture, and settle output -- it **(ed) and column chromatography (silica gel, methanol: chloroform =3:97 (volume ratio)) refined. Ir (2, 4-F-ppy) $_2$(3-ST-pic) 72.0mg was obtained as a yellow crystal by furthermore recrystallizing it from hexane/chloroform. 58% of yield. Identification was performed by ^{1}H-NMR and CHN ultimate analysis. ^{1}H-NMR (270 MHz, DMSO-d_6), ppm: 8.59 (d, 1H, J= 5.1 Hz) and 8.3 - 8.2 (m, 2H), 8.1 - 8.0 (m, 2H), 7.9 (d, 1H, J= 8.6 Hz), 7.67 (d, 1H, J= 5.1 Hz) and 7.6 - 7.3 (m, 7H), 6.9 - 6.7 (m, 3H), 5.85 (d, 1H, J= 17.8 Hz), 5.67 (dd, 1H, J= 8.9, 2.4 Hz), 5.45 (dd, 1H, J= 8.9, 2.4 Hz), 5.29(s,2H), 5.27(d,1H,J=11.1Hz).Anal. Found: C 53.71, H 2.90, N 5.03. Calcd:C 53.75, H 2.93, N 5.08.

[0177]

[Formula 30]



(19)

(Example 7-2) Composition of the copolymer (it abbreviates to an Ir(2, 4-F-ppy) $_2$(3-ST-pic)/VCz copolymer hereafter.) of the vinylcarbazole which has Ir(2,4-F-ppy) $_2$ (3-ST-pic) which has a blue phosphorescence luminescence part, and a hole transportability function
N-vinylcarbazole Ir(2, 4-F-ppy) $_2$(3-ST-pic) 41.3mg compounded in 966 mg (5.0mmol) and Example 7-1 (0.05mmol), azobisuisobutironitoriru 8.2mg (0.05mmol) was dissolved in 25 ml of drying toluene, and argon was blown for further 1 hour. Carried out temperature up of this solution to 80 **, the polymerization reaction was made to start, and it stirred as it is for 8 hours. After cooling, reaction mixture was dropped into 250 ml of methanol, polymer was settled, and filtration recovered. After refining by dissolving the collected polymer in 25 ml of chloroform, dropping this solution into 250 ml of methanol, and making it reprecipitate, 722 mg of Ir(2, 4-F-ppy) $_2$(3-ST-pic)/VCz copolymers which are an object were obtained by carrying out vacuum drying at 60 ** for 12 hours.

[0178]

Content of an ultimate analysis result of Ir of an obtained copolymer (phosphorescence luminescence compound) to Ir complex (phosphorescence luminescence unit) was 1.04-mol%. GPC in chloroform of a copolymer to weight average molecular weight was 11400 in polystyrene conversion.

[0179]

(Example 7-3) A copolymer of vinylcarbazole which has [6-(4-vinylphenyl)-2,4-hexane dionate] screw [2-(2-pyridyl) benzo thienyl] iridium (III) which has a red phosphorescence luminescence part, and a hole transportability function (hereafter) It abbreviates to an Ir(btp) $_2$[1-(StMe)-acac]/VCz copolymer. Composition
N-vinylcarbazole 1.55 g (8.0mmol) and Ir(btp) $_2$ [1-(StMe)-acac] compounded in Example 6-3 33.1 mg (0.04mmol), azobisuisobutironitoriru 13mg (0.08mmol) was dissolved in 40 ml of drying

toluene, and argon was blown for further 1 hour. Carried out temperature up of this solution to 80 **, a polymerization reaction was made to start, and it stirred as it is for 8 hours. It is methanol after cooling and about reaction mixture. It was dropped into 250 ml, polymer was settled, and filtration recovered. Collected polymer is dissolved in 25 ml of chloroform, and it is methanol about this solution. After refining by being dropped into 250 ml and making it reprecipitate, Ir(btp) $_2$[1-(StMe)-acac]/VCz copolymer which is an object by carrying out vacuum drying at 60 ** for 12 hours 1.12 g was obtained.

Content of an ultimate analysis result of Ir of an obtained copolymer (phosphorescence luminescence compound) to Ir complex (phosphorescence luminescence unit) was 0.59-mol%. GPC in chloroform of a copolymer to weight average molecular weight was 10800 in polystyrene conversion.

[0180]

(Example 7-4) A trial production of an organic light emitting element

An Ir(2, 4-F-ppy) $_2$(3-ST-pic)/VCz copolymer compounded in Example 7-2, an Ir(btp) $_2$[1-(StMe)-acac]/VCz copolymer compounded in Example 7-3, and chloroform fluid of tBu-PBD were prepared. In 66.85 mass % and an Ir(btp) $_2$[1-(StMe)-acac]/VCz copolymer, 3.15 mass % and tBu-PBD made [an Ir(2, 4-F-ppy) $_2$(3-ST-pic)/VCz copolymer] a ratio 30.00 mass %.

[0181]

On a glass substrate to which ITO was attached in this solution, the spin coat was carried out, a 100-nm-thick film was formed, on it, 10 nm and 100 nm of aluminum were vapor-deposited with a vacuum deposition method, and Ca was used as the negative pole.

[0182]

When negative voltage was impressed to the ITO side of an obtained organic light emitting element at the aluminum positive side, white luminescence was observed with the naked eye.

[0183]

An emission spectrum of an organic light emitting element is shown in drawing 4. A light emission peak corresponding to an Ir(2, 4-F-ppy) $_2$(3-ST-pic)/VCz copolymer and an Ir(btp) $_2$[1-(StMe)-acac]/VCz copolymer was observed near 480 nm and near 620 nm, respectively. Chromaticity coordinates were (0.30, 0.35).

[0184]

As mentioned above, although an embodiment of the invention and an example have been described concretely, this invention is not limited to these embodiments and examples, and it can change or transform these embodiments of the invention and an example, without deviating from main point and a range of this invention.

[Industrial applicability]

[0185]

This invention is applicable to a phosphorescence luminescence compound, a phosphorescence luminescence constituent, an organic light emitting element, and a display of an organic high polymer used as a material of an organic light emitting element.

[Brief Description of the Drawings]

[0186]

[Drawing 1]It is a figure explaining a typical structure of the phosphorescence luminescence compound of the organic high polymer of this invention.

[Drawing 2]It is a figure explaining the laminated structure of the organic light emitting element of this invention.

[Drawing 3]It is a figure showing the emission spectrum of the organic light emitting element produced in Example 6-3.

[Drawing 4]It is a figure showing the emission spectrum of the organic light emitting element produced in Example 7-2.